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SHOP PRACTICE

MACHINE AND TOOL DESIGN

MANAGEMENT PROBLEMS AND MEETINGS

DEPARTMENTS

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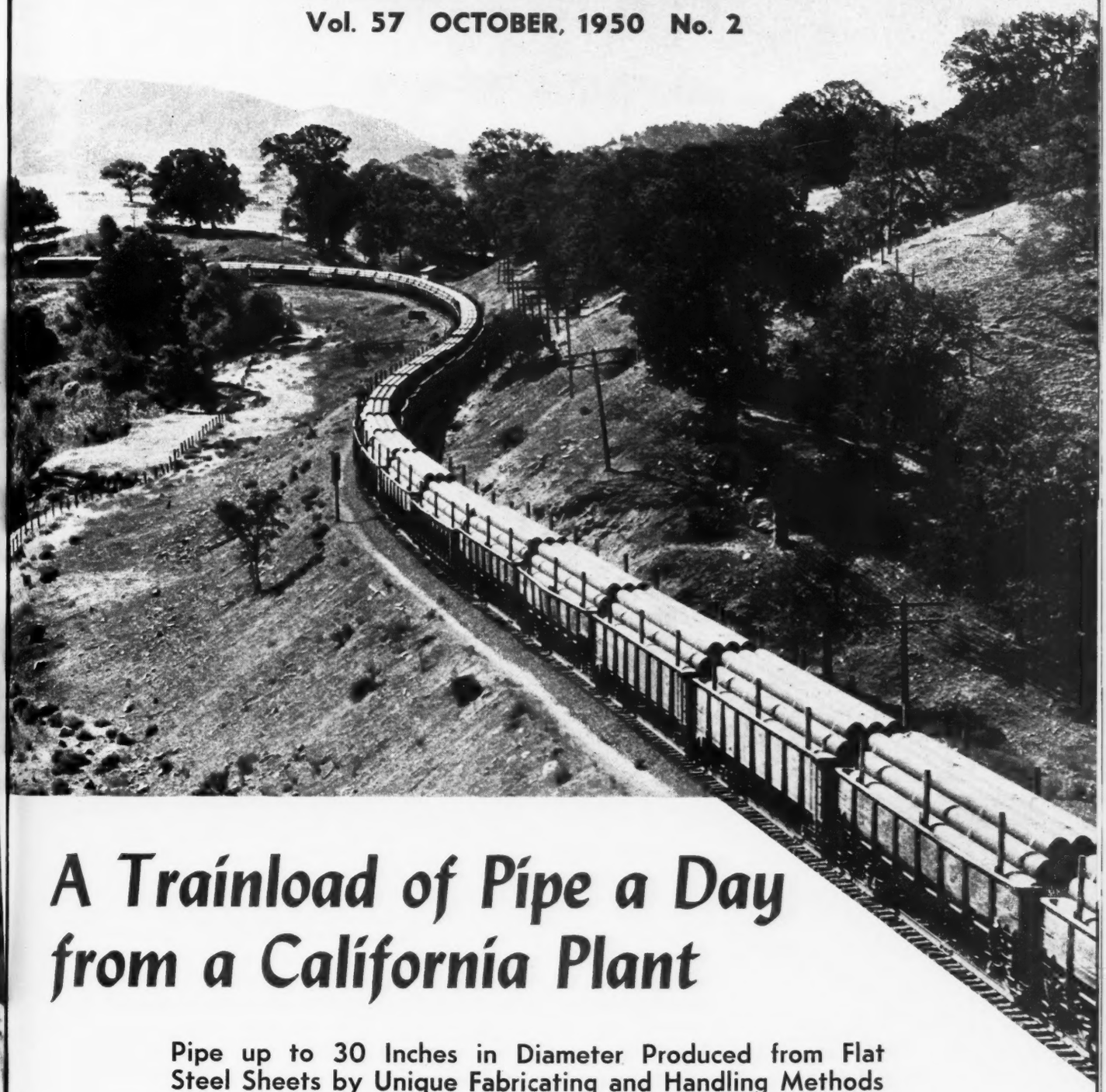


A Trainload of Pipe a Day from a California Plant

Pipe up to 30 Inches in Diameter Produced from Flat Steel Sheets by Unique Fabricating and Handling Methods

By CHARLES O. HERB

IN the hills of California fifty miles or so north of the Golden Gate is one of the most modern pipe producing plants in the world. This plant, operated by the Basalt Rock Co., Inc., at Napa, was developed after the second World War to take advantage of facilities acquired for building barges and small seagoing ships through the war years. A great deal of new equipment had to be installed for fabricating the steel pipe, which is produced in sizes from 8 5/8 to 30 inches outside diameter. Wall thicknesses range from 0.188 to 0.500 inch, and the weight per foot from 16.90 to 157.53 pounds. All pipe is made in 40-foot lengths, suitable for oil, gas, and water lines.

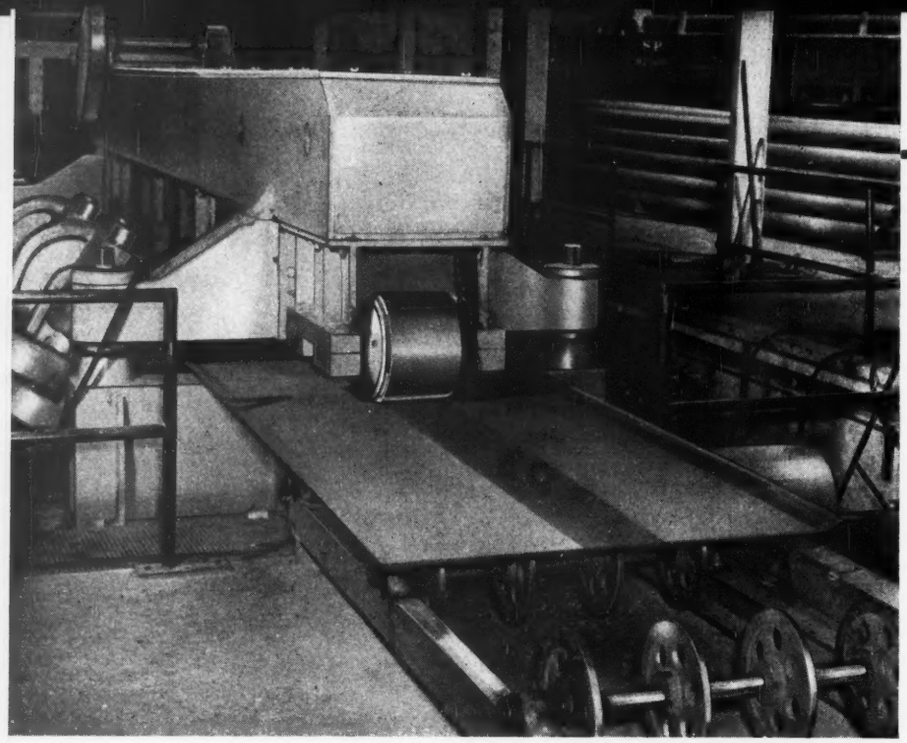


Fig. 1. Cutting the steel plate to exact width and preforming edges is the first step in the fabrication of pipe from 8 5/8 to 30 inches in diameter

The first operation in producing the pipe consists of cutting the plates to approximately the required width for one pipe. This is accomplished by heavy rotary shears. A hydraulic ram holds each plate square with the rotary shears during the operation. To the front end of the plate is attached a steel cable which is drawn around a drum to pull the plate quickly through the shears.

The sheared plates are delivered automatically to racks lying in a horizontal position, which are turned upright after the plates have been loaded on them flat. These racks, or "baskets," are then transferred by an overhead crane to a series of pickling and rinsing tanks. The plates are immersed, successively, in a sulphuric acid tank, a tank containing a neutralizing solution, and a water rinse tank, in order to thoroughly remove all mill scale. One of the reasons close attention is given to the cleaning process is to insure that a good external surface will be produced for the coating which may be applied to the pipe in the field. When the plates come from the cleaning baths, they are stored vertically until required in the fabricating department.

Pipe from 8 5/8 to 20 inches in diameter is produced in one building, and the larger sizes in another building, using straight-line methods that are similar except in certain instances that will be pointed out later. The first step in the actual fabrication of the pipe consists of trimming the edges to the exact width and preforming them slightly, as seen in Fig. 1. The rotary shears on this machine and also the preforming rollers are mounted on slides on opposite sides of the machine. These slides can be adjusted in and out to suit the required plate width. Ten rubber feed-rolls, located along the center line of the equipment, carry the plates through the operation.

From the preforming operation, the plates are automatically fed to a dual-cylinder hydraulic press, such as illustrated in Fig. 2, which is equipped with a cylindrical type of punch 40 feet

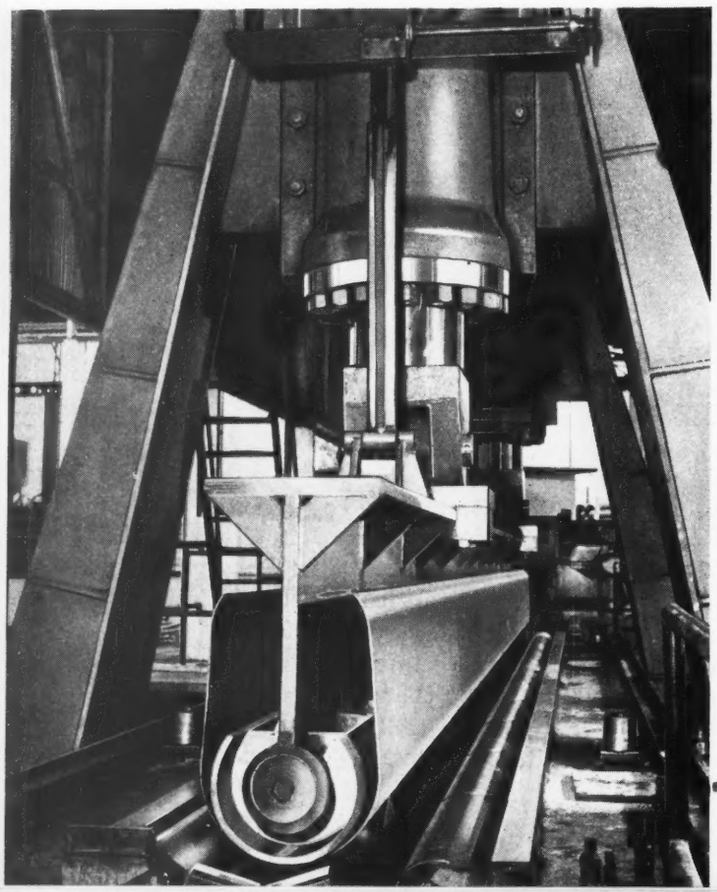


Fig. 2. The plates are bent into a U shape by a downward moving ram and rollers that are actuated toward each other horizontally

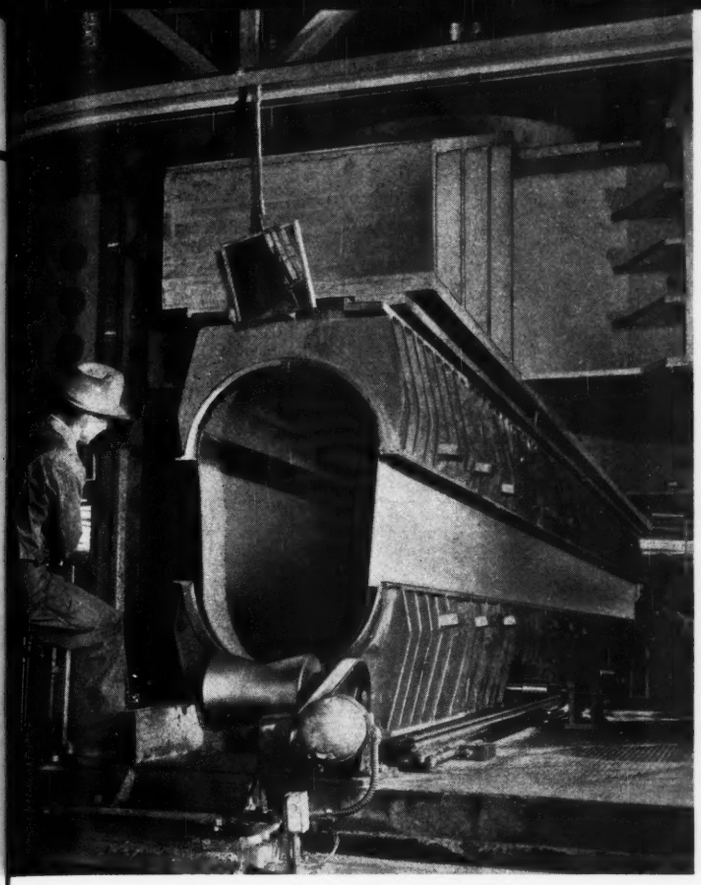


Fig. 3. Beginning of the operation that finish-forms the pipe into a cylindrical shape under heavy hydraulic pressure

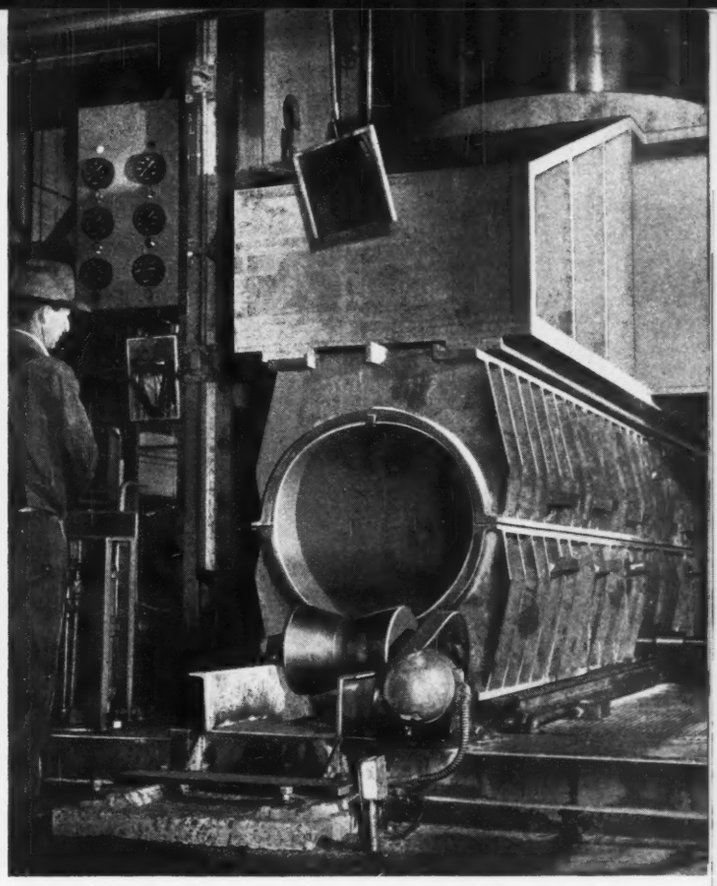


Fig. 4. Another view of the press and dies illustrated in Fig. 3, at the completion of the pipe-forming operation

in length. When the ram comes down, this punch pushes the flat plate down between rolls that extend the full length of the press bed on both sides. Simultaneously, the rolls are fed toward the center of the bed, bending the plate into a U shape as shown. The formed plate is supported beneath the punch by pairs of wheel-like rollers, mounted on a vertical slide that moves up and down in synchronism with the ram movements.

The next plate to be formed pushes the U-shaped plate out of the press as it advances. The formed plate is then fed through a machine equipped with four nozzles that spray a lubricant along the two top edges of the plate on the outside to facilitate the next forming operation.

The U-shaped plate is then automatically carried into the die of a high-capacity hydraulic press, which is partially shown in Fig. 3. This

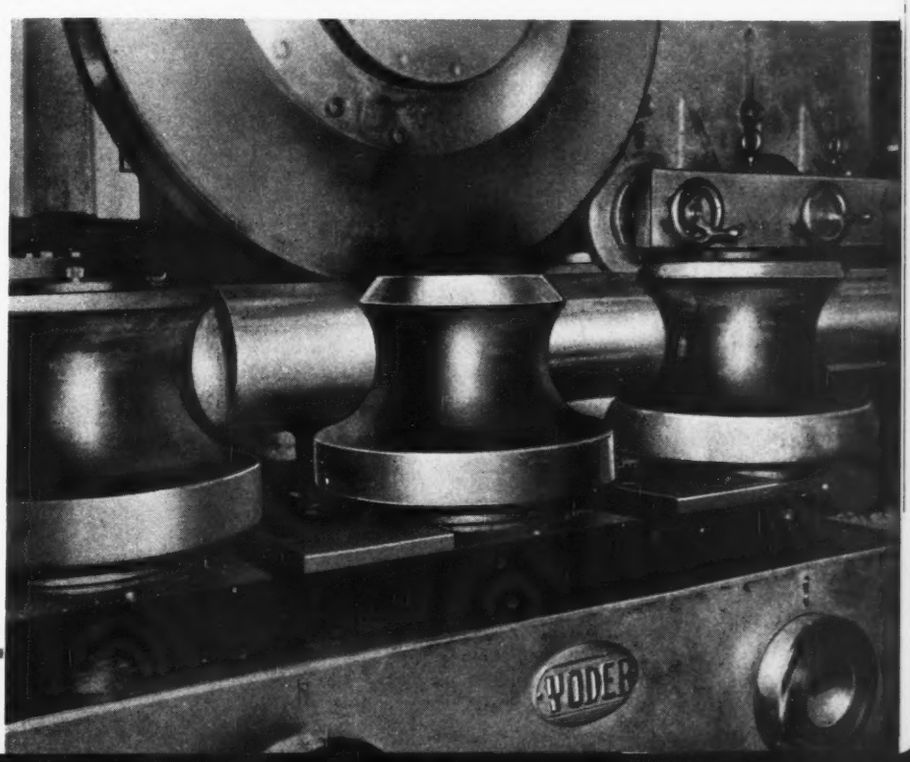


Fig. 5. Yoder electric resistance welder with rotating electrode 5 feet in diameter being employed for welding a length of pipe

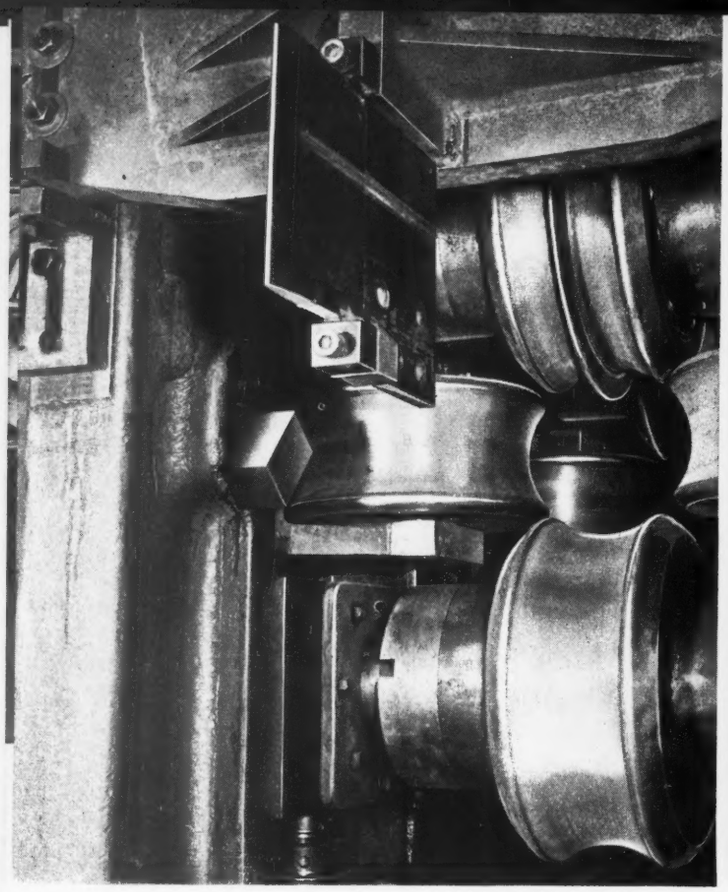


Fig. 6. One of the Turk's-heads on the Yoder electric welder, showing the central flange on top roller, which holds pipe seam in line with rotating electrode

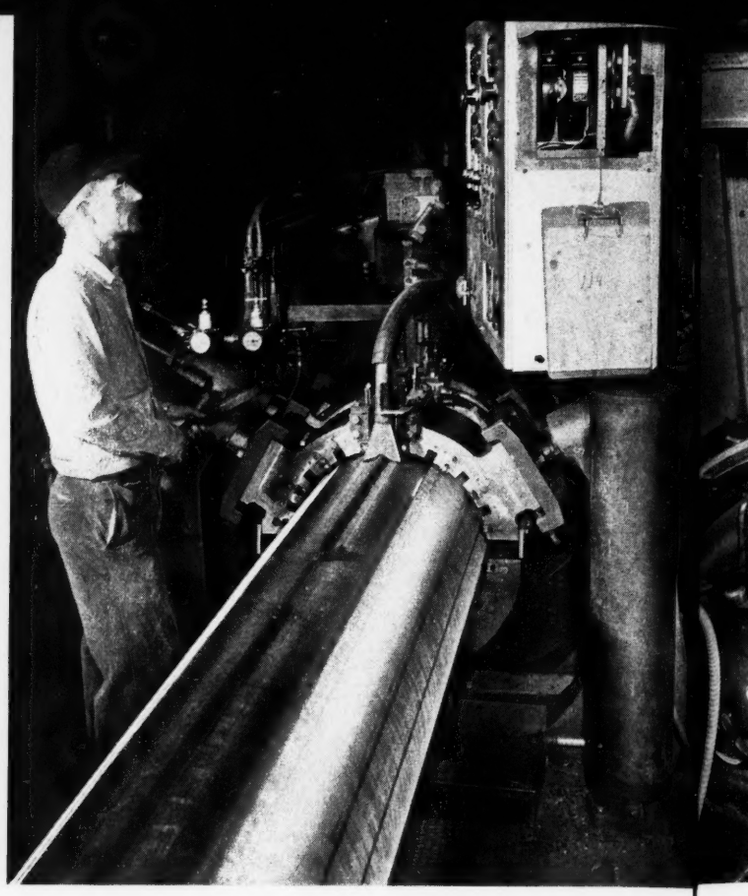


Fig. 7. Twenty-inch pipe being welded by the submerged-arc method in a Berkeley machine, which, like the Yoder machine, completely welds the pipe in one operation

press is equipped with upper and lower die members 40 feet in length. The rounded end of the formed plate is first fed into the bottom die member, after which the upper member is lowered to form the pipe into a true cylinder. In Fig. 3, the upper die member is seen near the beginning of its stroke, while Fig. 4 shows this member in its bottom position, with the pipe completely formed and its two edges lined up against each other for welding.

The completely formed plate, now an unwelded pipe, is pushed automatically out of the die by the incoming piece. Oil is then removed in a detergent bath prior to welding the seam.

Welding is performed by three different processes, depending upon the size of the pipe and

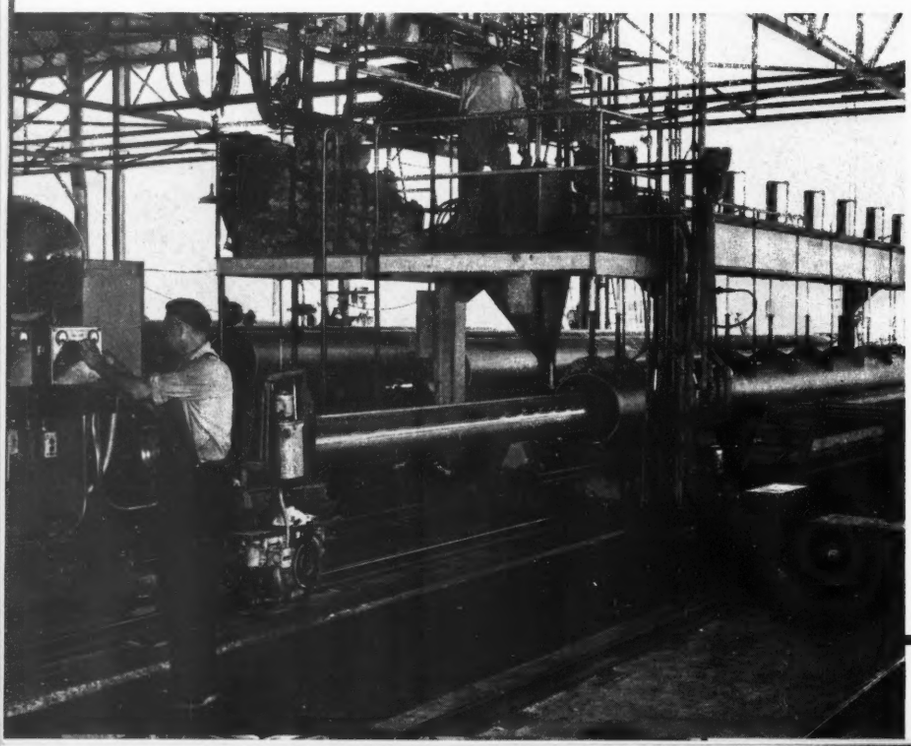


Fig. 8. Special machine equipped with a long boom for welding large-diameter pipe on the inside by means of the submerged-arc method

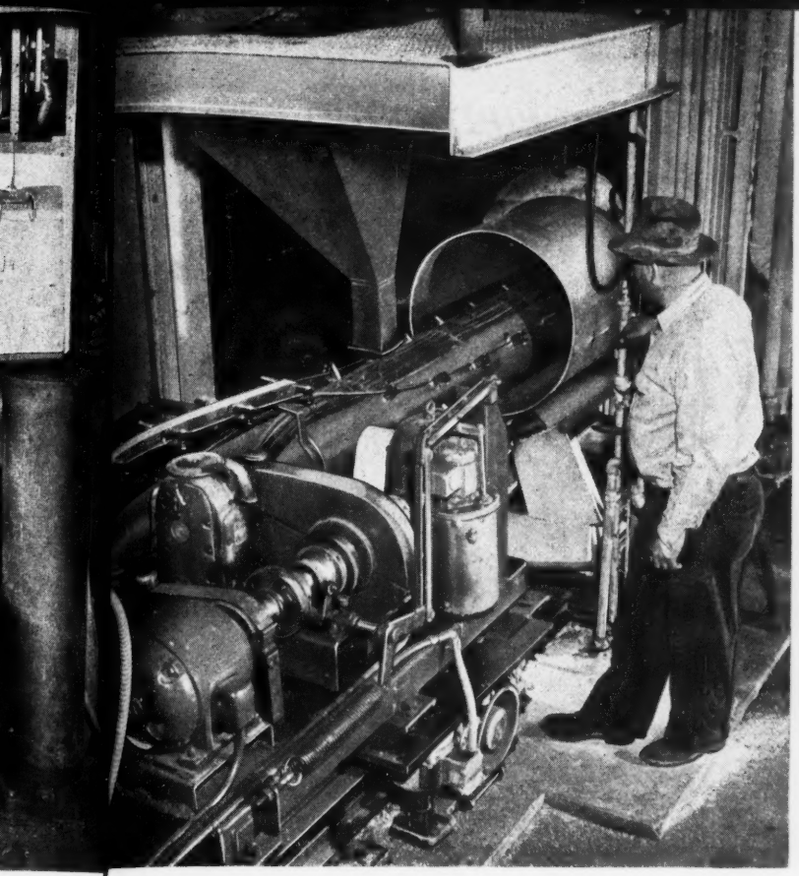


Fig. 9. Close-up view of machine illustrated in Fig. 8, the backing-up bar in this operation being supported by a hose inflated with air

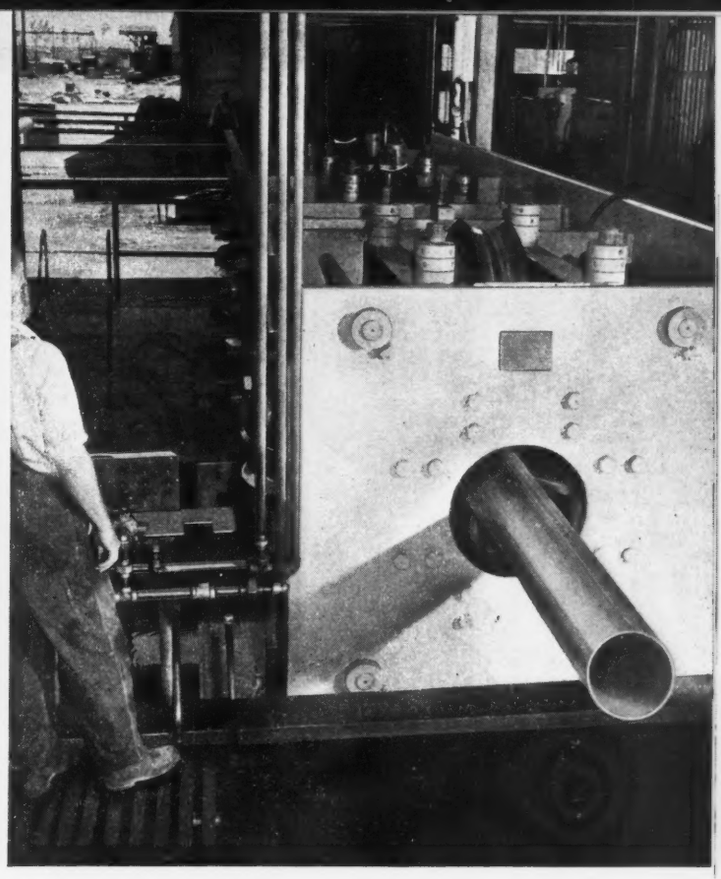


Fig. 11. Pipe 20 inches in diameter and less is compressed during straightening operation, which insures exact dimensions and increases yield strength

other considerations. One of the methods involves the use of a Yoder 1500-KVA electric resistance welder, Fig. 5, which completely welds the pipe in one operation. Rollers arranged in two Turk's-heads, as illustrated in Fig. 6, feed the unwelded pipe under the circular electrode seen in Fig. 5, which is approximately 5 feet in diameter. The top roll in each Turk's-head is provided with a thin flange in the center, which rides in the slit where the edges of the pipe come together and thus holds the pipe in true alignment with the revolving electrode.

After the pipe leaves the electrode, it passes under tools that cut away the excess weld metal, or flash, from both the inside and outside. The pipe then goes through several sets of rollers

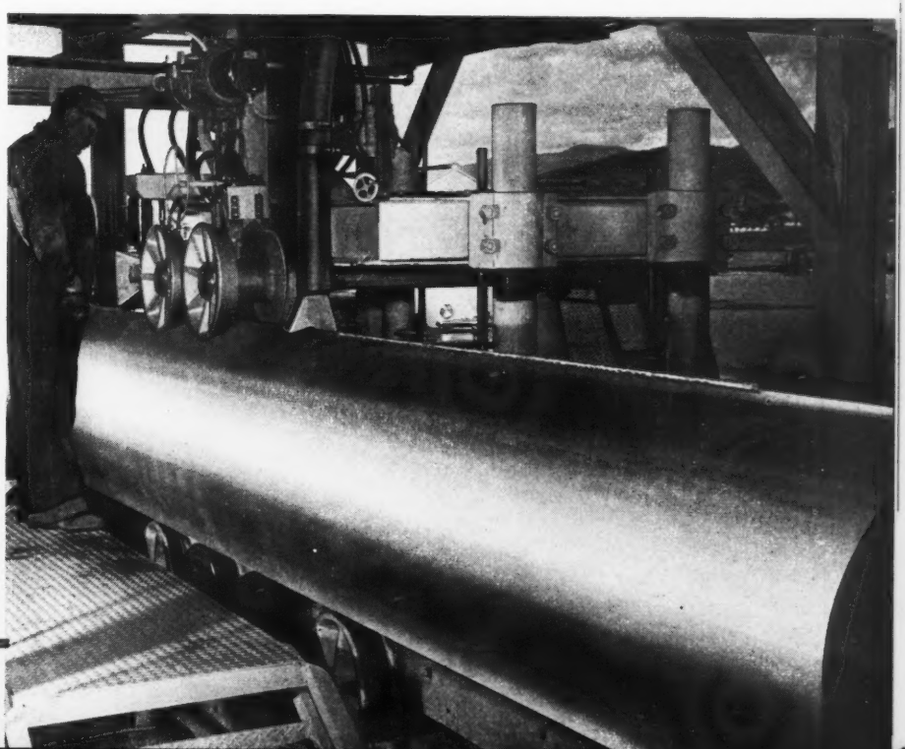


Fig. 10. View of external submerged-arc welding operation. Here it will be noted that the pipe is fed beneath the welding head

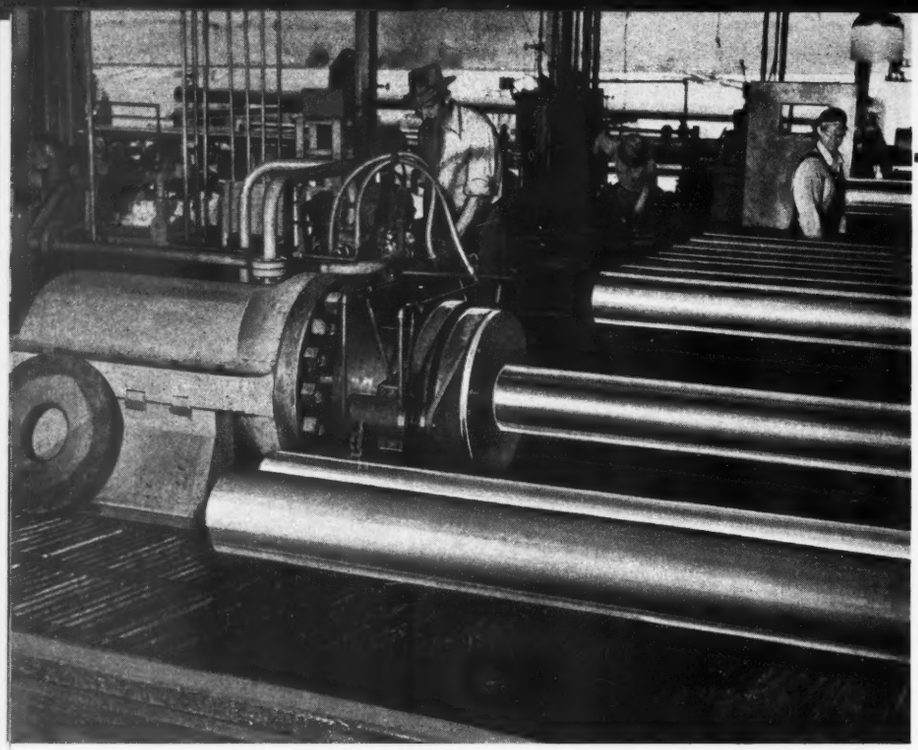


Fig. 12. All pipe undergoes a hydrostatic test to insure required quality. Here is shown the equipment used in testing pipe 20 inches and less in diameter

which exert sufficient pressure to hold the welded edges securely together until the pipe has cooled.

Another welding method, employed on pipe 20 inches in diameter and under, involves the use of a Berkeley submerged-arc welder of the construction illustrated in Fig. 7. In this process, a copper backing-up bar on the inside of the pipe insures complete penetration of the deposited metal between the two pipe edges, so that external welding only is necessary to insure satisfactory joining of the edges.

Submerged-arc welding on both the inside and outside of the pipe is performed on sizes over 20 inches in diameter. In this case, inside welding is done first, after the pipe edges have been tack-welded together and a small plate has been welded to one end of the pipe in line with the edges to be joined. By starting the laying of the weld metal on this plate, a completely satisfactory weld is obtained at the beginning of the pipe. The equipment used for inside welding is shown in Fig. 8. The welding head is mounted at one end of a long boom, a close-up view of which is shown in Fig. 9. Welding is, of course, performed along the bottom of the pipe.

A unique method of holding the backing-up bar against the under side of the pipe involves the use of a hose inflated with air. The welding head is guided along the edges to be joined by a small knurled wheel which rides in the small space between the edges. Flux for the operation is delivered to the welding head by a hopper mounted on an overhead platform.

For external welding, the pipe is fed under the welding head by rollers, as seen in Fig. 10. Four tapered rollers support the welding head

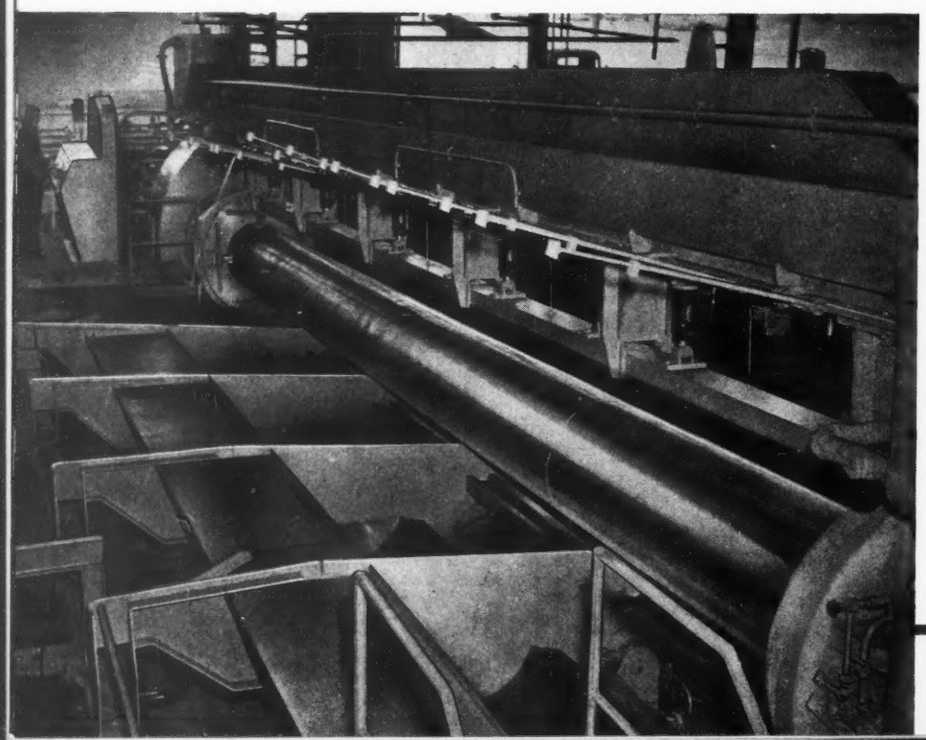


Fig. 13. View of special equipment employed for straightening pipe and for a subsequent hydrostatic test; the illustration shows a hydrostatic test in progress

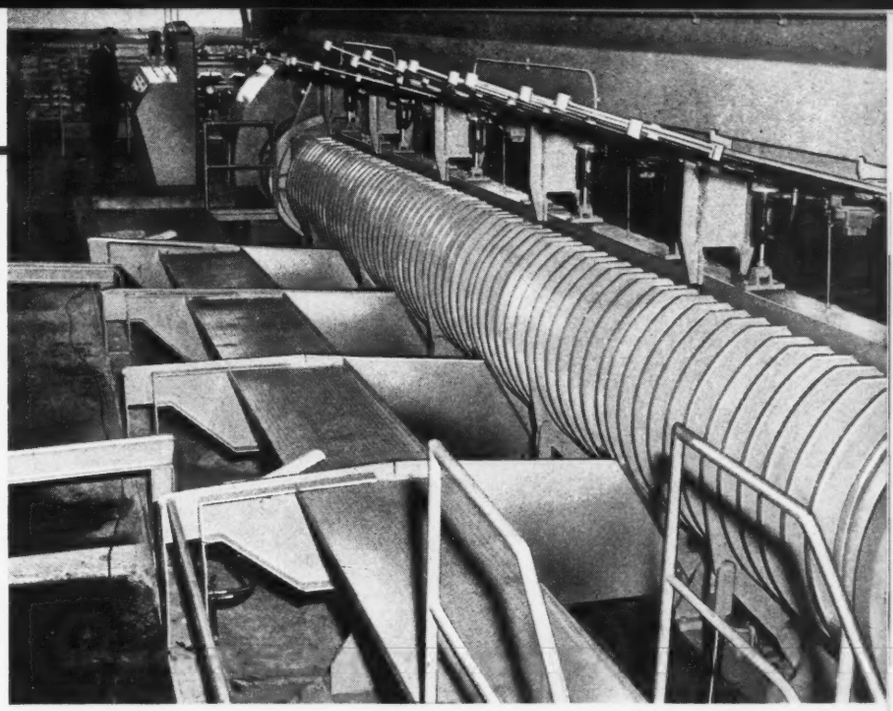


Fig. 14. Pipe that is larger than 20 inches in diameter is expanded and straightened under hydraulic pressure with the pipe confined within heavy steel dies

on the pipe. Alignment of the head with the seam is controlled by a dog on the front of the head which engages the narrow path between the edges. Twin electrodes insure sound welds.

All sizes of pipe go through a straightening operation after welding. In this operation on pipe 20 inches in diameter and under, the pipe is also compressed to the finished diameter, and this results in a substantial increase in the yield strength of the pipe because of the cold reduction. A view of one of the machines that straightens, sizes, and cold-reduces in one operation is illustrated in Fig. 11.

Pipe coming from this machine is next passed to equipment such as illustrated in Fig. 12 to undergo a hydrostatic test. While under full pressure, the pipe is given hammer tests to detect any flaws. Finally, each pipe is subjected to a rigid inspection before shipment.

Pipe larger than 20 inches in diameter is expanded during the straightening and sizing operation in order to increase its yield strength by cold-working. Expansion and straightening are accomplished in the machine shown in Fig. 13, which is used also for the hydrostatic test. The illustration shows the equipment arranged for the hydrostatic test, during which pressures up to 4000 pounds per square inch are developed. Hammers actuated hydraulically deliver blows of measured impact along the seam to detect flaws. These hammers may be seen extending from the top rail of the machine.

For the straightening and expanding operation, which precedes the hydrostatic test, large dies hinged to the bed of the machine are swung upward on both sides of the pipe, as shown in Fig. 14, so as to enclose the pipe for its full length. There are five die sections on both the

Fig. 15. An inspector propels himself through the entire length of a 30-inch diameter pipe on a small four-wheeled truck for checking interior of pipe visually

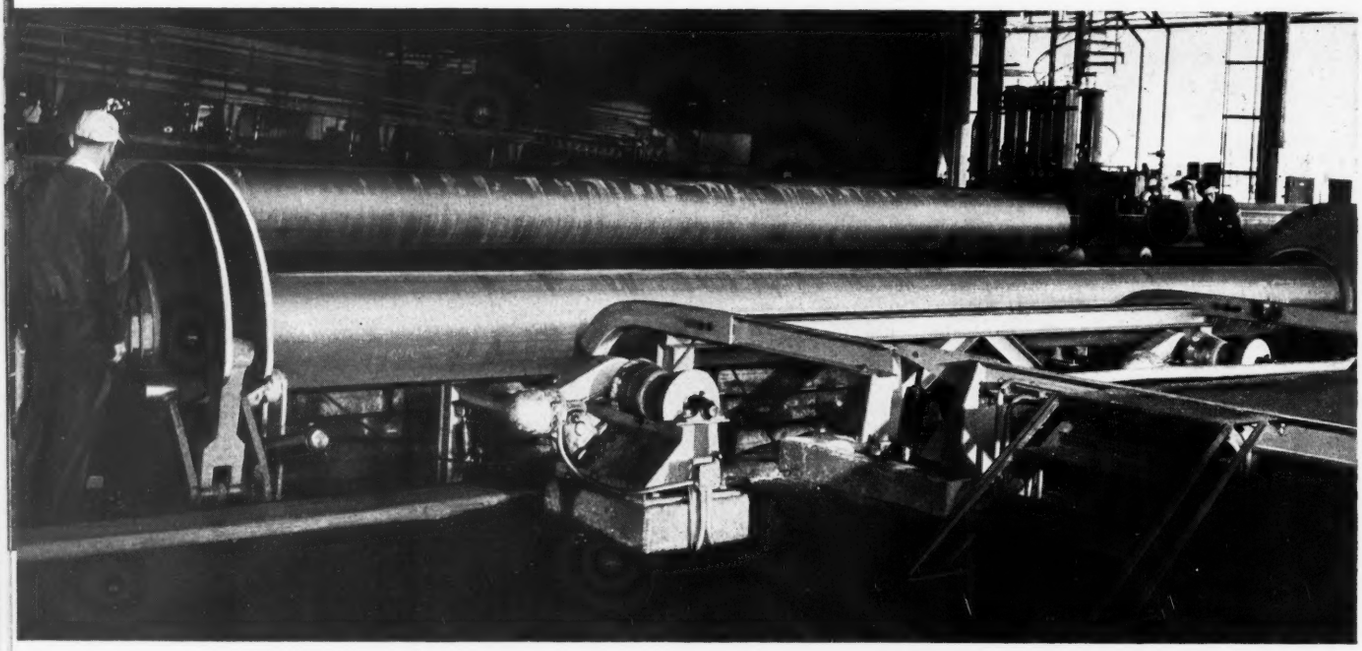


Fig. 16. Both ends of every pipe are simultaneously faced and beveled in a lathe, ready for end-to-end welding of pipe lengths in the field

front and back of the pipe. They are actuated hydraulically, and are locked in the closed position. Water entering the pipe at the required pressures expands it against the inside of the dies and straightens it simultaneously. The pipe is stretched as much as 1/2 inch on the diameter.

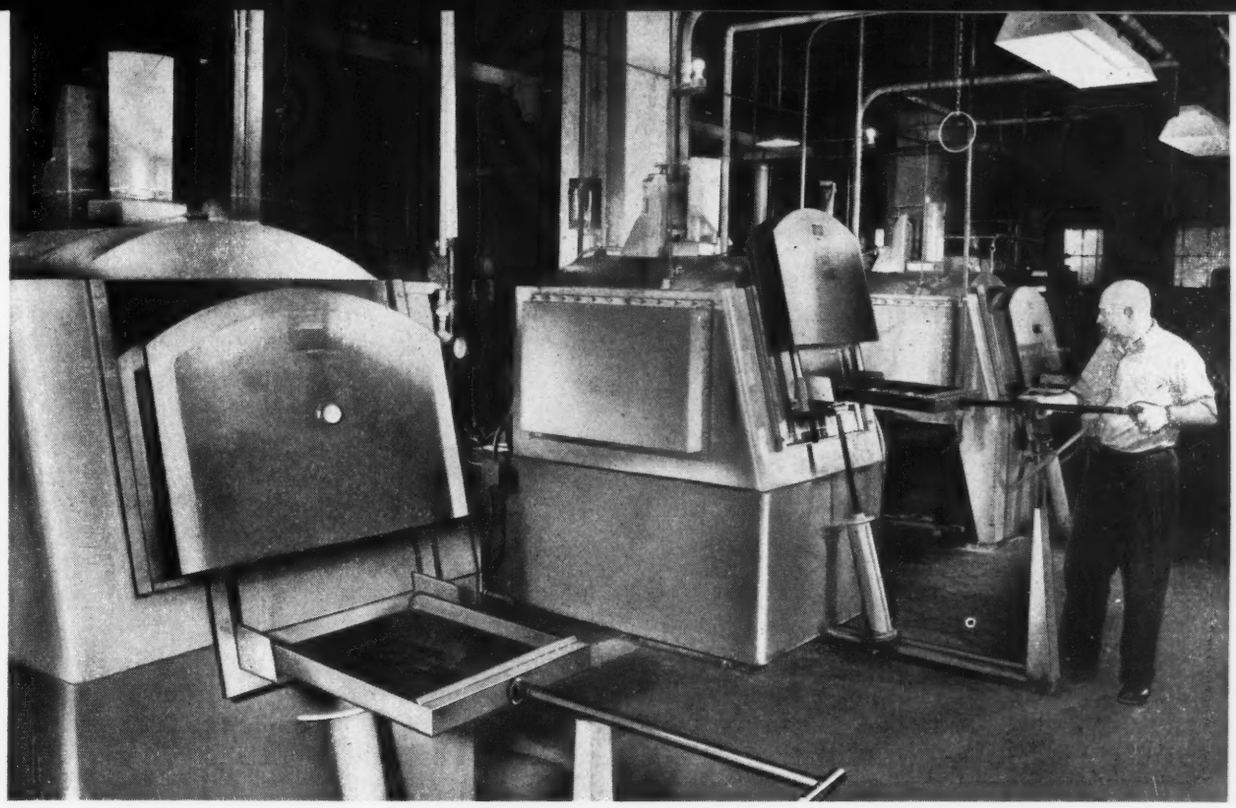
The dies are opened before making the hydrostatic test, so that the pipe wall itself takes up all the stresses exerted in the test.

Opposite ends of all pipes are faced and beveled in a lathe to prepare them for end-to-end welding in the field. One of the lathes used for large-diameter pipe is shown in Fig. 16. This illustration also shows equipment employed for automatically loading and unloading the pipes. Tools for simultaneous operation on both ends of the pipe are mounted on headstocks at the two ends of the lathe bed.

Finally, all pipe is given a thorough inspection inside and out. For inside checking, an inspector propels himself through the pipe for the entire length on a small truck, as seen in Fig. 15, to obtain a complete visual inspection of the internal surface.

Manual handling of plates and pipe is completely eliminated by the provision of automatic equipment. Much of the handling equipment is of unique design, and is one of the most important factors in the production of pipe at rates up to several miles a day.

This pipe is distributed by the Kaiser Steel Corporation under the name of Basalt-Kaiser.



Automatic Casehardening of Small Stampings

By Wasson C. Pfeiffer
Manufacturing Research Engineer
Burroughs Adding Machine Co., Detroit, Mich.

Gas Carburizing and Carbo-Nitriding of Flat and Round Parts for Business Machines are Accomplished in Batch Type, Atmosphere-Controlled Furnaces with a Completely Automatic Cycle. More Uniform Case Depths and Cleaner Work-Pieces are Obtained at Lower Cost

ABOUT 25 per cent of the million parts produced each day by the Burroughs Adding Machine Co. for bookkeeping, accounting, calculating, and statistical machines require heat-treatment. Many of these parts are small, thin sheet-metal stampings that must be casehardened to resist impact and frictional wear.

Although a relatively shallow case is required on these stampings, uniformity of hardness and case depth is essential, distortion must be minimized, and close tolerances have to be maintained. These conditions are difficult to meet, but excellent results have been effected by gas carburizing and carbo-nitriding such parts in batch type, atmosphere-controlled furnaces with completely automatic cycles.

A battery of these electrically heated, batch-loading, bright-hardening furnaces, seen in the heading illustration, has been installed at the Burroughs plant. The furnaces, made by Ipsen Industries, Inc., Rockford, Ill., are mounted directly over an automatic unloading quench tank, which permits the heated parts to be quenched while still in the protective atmosphere. Heating and quenching cycles are pre-set by means of automatic timers. Uniform case depths and clean work-pieces, with practically no distortion, are obtained by this method, and production has been increased, while at the same time, costs have been lowered.

Small lots of a wide variety of parts can be handled in each furnace. The hardnesses and case depths can be varied to suit specifications by changing the temperature, atmosphere, or the time of the heating and cooling cycles.

As seen in Fig. 1, and at the left in Fig. 2, the door of the furnace and a scoop loaded with parts are lifted by a foot-pedal controlled pneu-

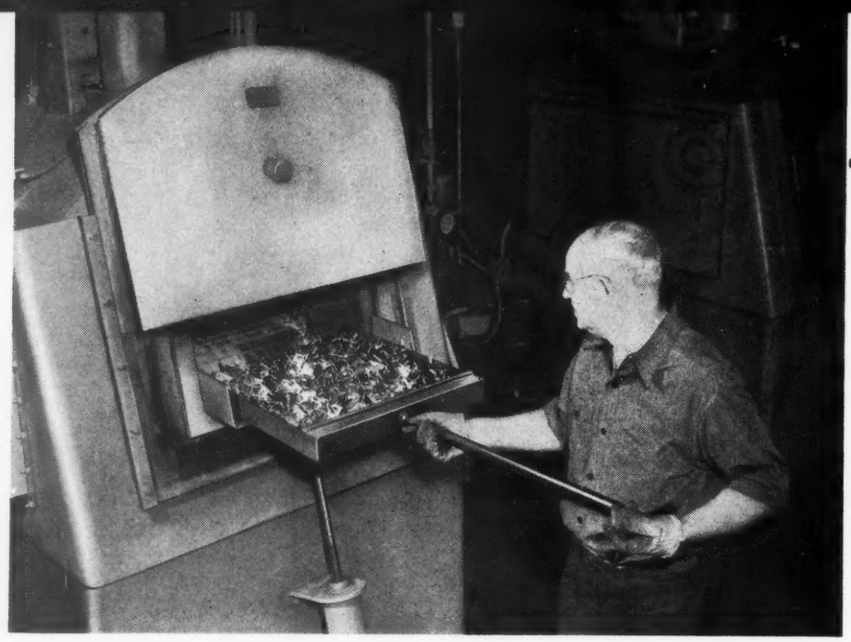


Fig. 1. A scoopful of sheet-metal stampings to be heat-treated is lifted into the loading position and the furnace door is raised by a foot-pedal controlled pneumatic cylinder

matic cylinder. The parts are distributed evenly over the alloy-steel hearth belt, the empty scoop is withdrawn, and the furnace door is lowered by lifting the foot from the control pedal. Each furnace is provided with two timers which are pre-set to control automatically the length of the heating and quenching cycles. When the timers have been set, a push-button is depressed to begin the automatic processing.

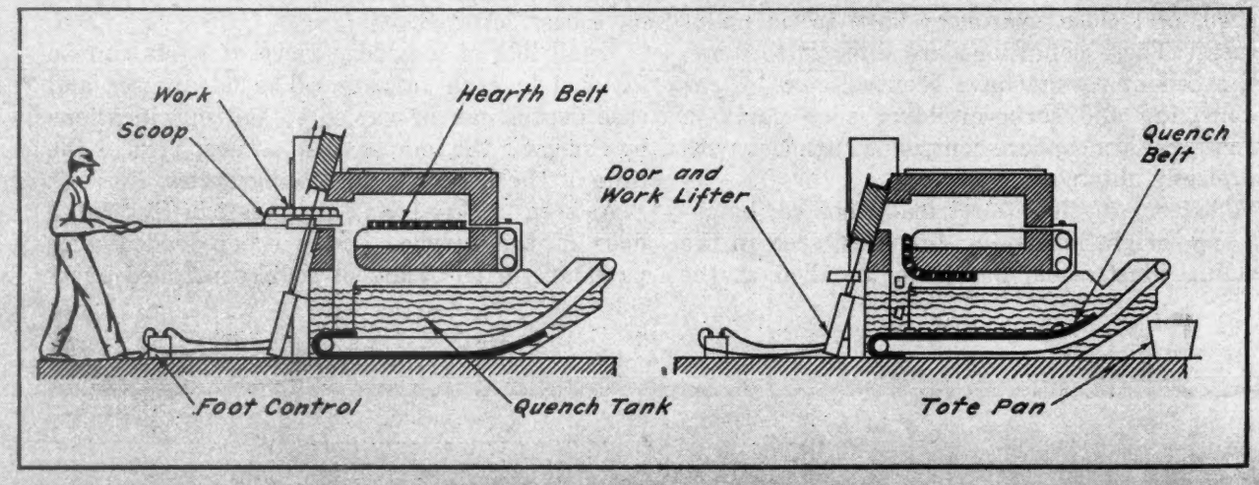
At the completion of the pre-set heating cycle, the hearth belt automatically moves forward slowly (as shown at the right in Fig. 2), thus dropping the parts gradually on a wire-mesh, alloy-steel belt at the bottom of the oil quenching tank. Simultaneously, the quench belt starts moving in the opposite direction at twice the speed of the hearth belt. The parts are thus distributed evenly in the quenching medium. Movement of the quench belt is stopped for the pre-set length of time, and then continues onward to drop the hardened parts into a tilt type container, Fig. 3, at the rear of the furnace.

When the quenching oil has drained from the parts, the container is tipped to deposit the parts in a tote pan. In the meantime, the hearth belt, mounted on a short section of two endless chain conveyors, is automatically returned to its original position. The direction of movement is reversed for the return of the hearth belt, while the quench belt continues moving in the same direction. A signal light indicates when the furnace is ready for reloading.

Electrical heating elements are encased in refractory tubes, six tubes being provided across the top and six below the hearth. The maximum operating temperature of the 40-kilowatt furnaces is 1750 degrees F. The hearth belt is 24 inches wide by 36 inches long, and about 200 pounds of parts can be heat-treated per hour. Quenching oil is maintained at a temperature of 170 degrees F. by recirculation through the 400-gallon capacity tank.

The protective atmosphere employed in the furnace is produced in two endothermic generators, Fig. 4, each having a capacity of 500 cubic feet per hour. Natural gas, mixed with air in the ratio of one part of gas to two and a half parts of air, is pumped into a catalyst-filled

Fig. 2. At the completion of a pre-set heating cycle, the hearth belt moves forward, thus dropping the heated parts on a second belt at the bottom of the quench tank



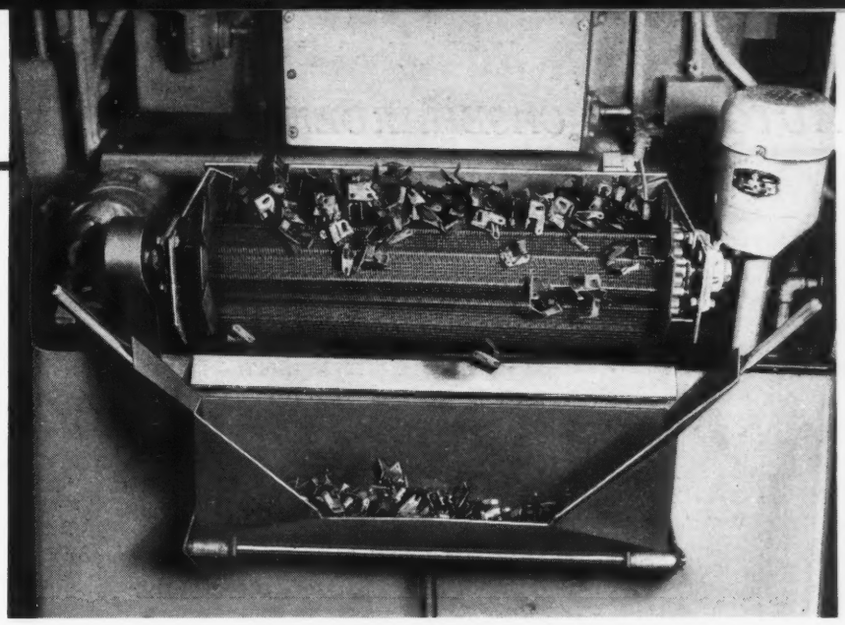


Fig. 3. A wire-mesh alloy-steel quench belt carries hardened parts out of furnace at rear, depositing them in a tilt type container for draining before being dropped into a tote box

retort that is electrically heated to a temperature of 2000 degrees F. The resulting gas, after being cooled by passing through a heat exchanger, has a dew point of 0 degrees F., and the following composition: 21 per cent carbon monoxide, 40 per cent hydrogen, 38 per cent nitrogen, and 1 per cent methane. This protective atmosphere is supplied to each furnace at the rate of 200 cubic feet per hour.

Anhydrous ammonia and natural gas are mixed with the prepared atmosphere in various ratios, depending upon the steel being heat-treated and the results desired. For producing a file-hard carbo-nitrided case 0.002 to 0.003 inch deep on S A E 1015 to 1018 steel stampings, ammonia gas is mixed with the prepared atmosphere at the rate of 25 cubic feet per hour. Although not essential for carbo-nitriding, natural gas is also added to the mixture at the rate of from 5 to 10 cubic feet per hour.

The heating and cooling cycle for carbo-nitriding will vary with the density of the load; however, for the average load of thin stampings made from S A E 1015 to 1018 steel, about ten minutes is required to heat the parts to 1520 degrees F., from ten to fifteen minutes at heat, and two minutes for quenching.

For producing a carburized case 0.015 inch deep with a hardness of 62 Rockwell C on S A E 1020 and 1112 steel stampings, natural gas is mixed with the prepared atmosphere at the rate of 25 cubic feet per hour. Ammonia, of course, is not necessary for carburizing, but it has been found that by mixing about 5 cubic feet per hour with the natural gas and prepared atmosphere, slightly harder cases can be obtained. The addition of such a slight amount of ammonia does not affect the carburizing, and the parts can be tempered or drawn when subsequent machining is necessary.

In heating S A E 1050 steel, ammonia is not added to the gas mixture. To produce a carburized case 0.015 inch deep, the parts are heated for about eight minutes to raise their temperature to 1600 degrees F., maintained at this temperature for approximately forty minutes, and quenched for two minutes. Carburized cases up to 0.040 inch deep are produced in these furnaces with correspondingly longer heating and cooling cycles. The carburizing cycle can be accelerated

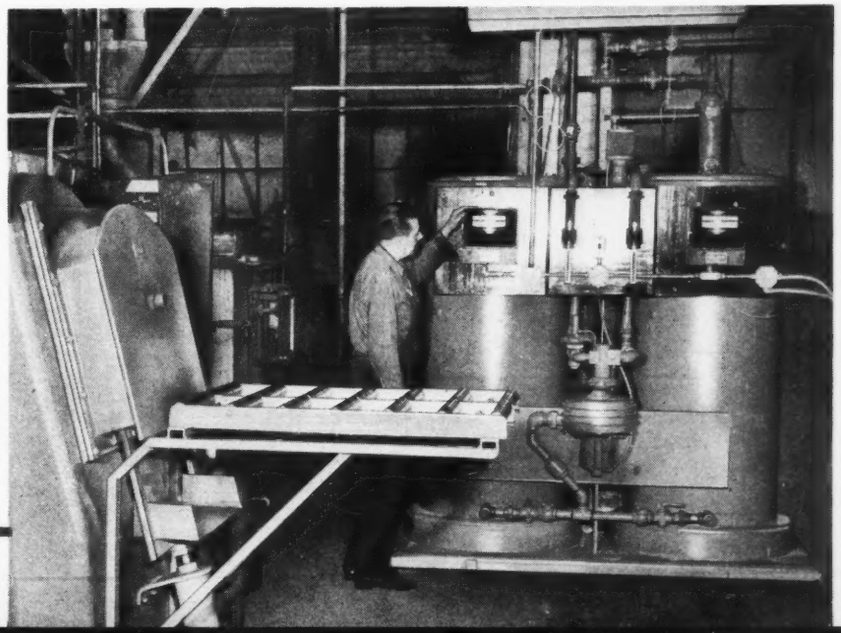


Fig. 4. Two endothermic generators, each rated at 500 cubic feet per hour, produce the protective atmosphere employed for carburizing or carbo-nitriding small stampings

by increasing the temperature, but the parts are more subject to distortion.

As a continuous supply of carburizing or carbon-nitriding gas is maintained to compensate for the electrically heated, enriched atmosphere that burns off at the top of the furnace, the desired case develops rapidly. Production obtained from three of these batch type, bright-hardening furnaces exceeds that previously obtained from seven cyanide pots. Also, the cyanide pots had the disadvantage of being limited to the production of a maximum case depth of 0.006 inch on light work, because of nitride build-up on the surface. Another advantage of the new method is the elimination of cyanide hazards. Cyanide pots are still employed, however, for localized selective hardening.

Parts coming from the atmosphere-controlled furnace are clean and bright. It is only necessary to remove the quenching oil from their surfaces by draining and vapor-degreasing prior to plating. Previously, cyanide had to be removed from the parts by pickling, which sometimes had a deleterious effect in the subsequent plating operation because of the fact that acid was carried over into the bath.

The general run of work handled in these furnaces consists of flat stampings ranging from 0.031 to 0.093 inch in thickness. Some round stock, however, is also treated in this way. Solid bars from 3/32 to 5/8 inch in diameter, and cored bars up to 1 1/4 inches in diameter have been hardened. The uniformity of case, 0.010 inch deep, produced on shafts as small as 0.100 inch in diameter in the atmosphere-controlled furnace was impossible to obtain with pack carburizing.

Long, thin parts, of intricate shape, that might be bent by dumping are held in specially designed fixtures and casehardened in the Ipsen furnace shown in cross-section in Fig. 5. This furnace is directly connected and sealed to an automatic quench tank.

The fixture, loaded with parts, is pushed through the front door onto the hearth. Both timers are set to control the heating and cooling cycles, and a selector switch is fixed to give either oil quenching or air cooling. At the completion of the pre-set heating cycle, an air-actuated intermediate door is lifted, two endless chains start rotating clockwise, and lugs projecting upward from the chains push the fixture of heated parts onto the elevator in the air cooling chamber.

If the selector switch is set on "Air Cool," the parts automatically remain in the air cooling chamber for the pre-set length of time, and are then removed manually through the unloading door at the rear of the furnace. If the switch has been set for oil quenching, the hydraulically actuated elevator automatically lowers the parts into the quench tank and lifts them out at the end of the pre-set quenching period. Signal lights indicate that the furnace is ready to be loaded when the fixture moves into the cooling chamber, and similar lights show when the fixture is to be removed from the cooling chamber.

To prevent contamination of the protective atmosphere in the heating chamber, provision is made to insure that the intermediate and the unloading doors cannot be raised simultaneously. With pre-set time cycles and automatic quenching, the human element is eliminated, distortion is minimized, and consistent results are obtained.

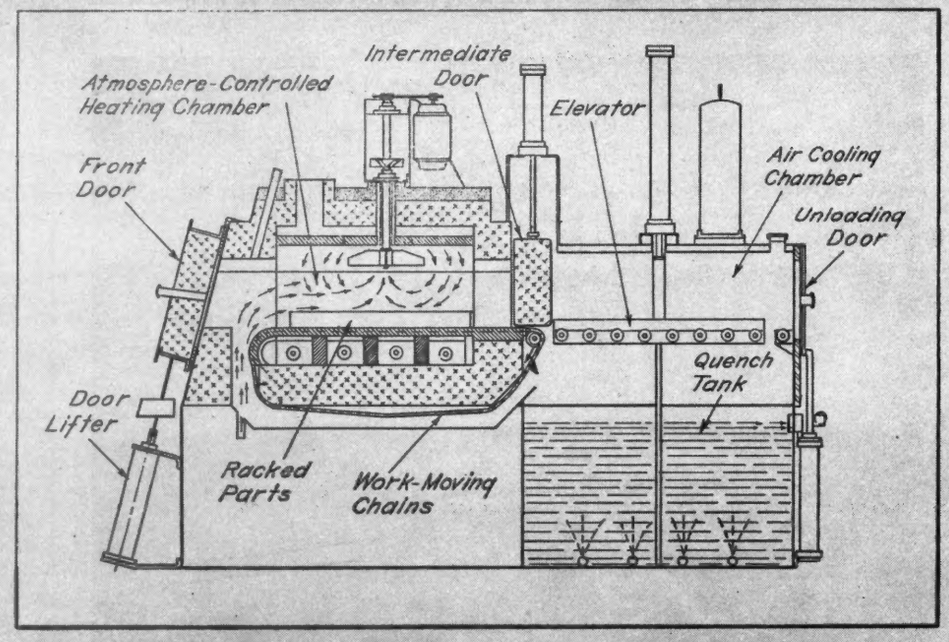
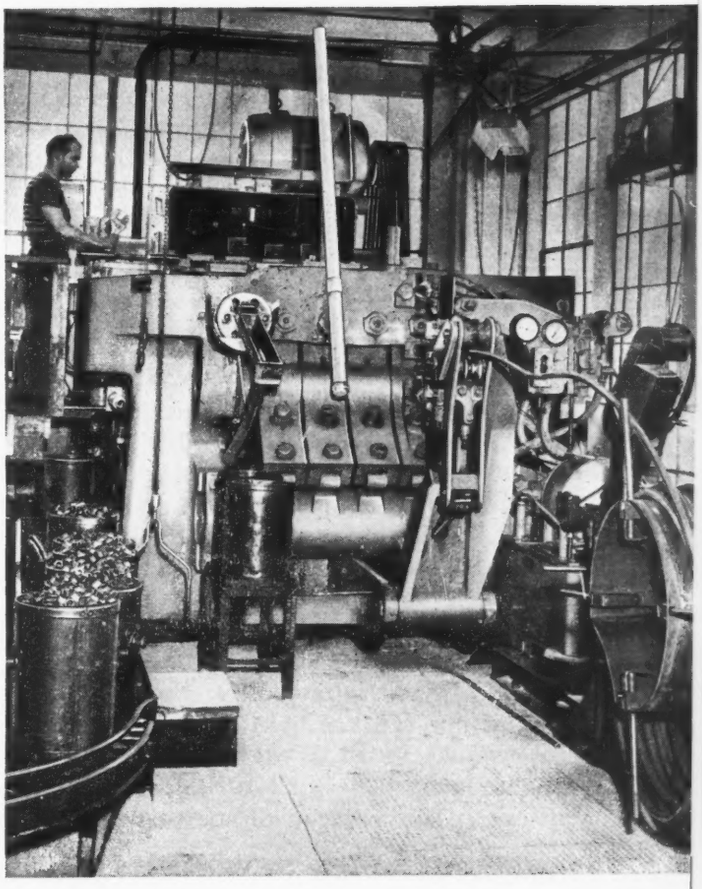


Fig. 5. Cross-section of batch-loading, atmosphere controlled furnace, connected and sealed to the quenching chamber. Work entering front door is automatically carried through the heating and quenching cycles

Cold-Forming Large Nuts at High Speed

A Production Rate of Forty-Two per Minute is Obtained in Forging Nuts on a Huge National Cold-Forming Machine that is Equipped with a Five-Station Transfer Mechanism

By JACK B. SPRINGER
President, Industrial Nut Corporation
Sandusky, Ohio



SPECIAL, large-size nuts previously produced from hexagonal stock on automatic screw machines are now being cold-forged from coiled round stock by the Industrial Nut Corporation (formerly the Brightman Nut & Mfg. Co.), Sandusky, Ohio. Improved physical properties are obtained as a result of the cold-working, and substantial savings have been effected through lower raw material costs.

A large variety of single- and double-chamfered, washer-faced, castellated, and other type nut blanks, ranging in size from 1 1/16 to 1 5/8 inches across the flats, are now being cold-formed on the huge machine seen in the heading illustration. This machine, made by the National Machinery Co., Tiffin, Ohio, is one of the first of its type to produce nuts by the cold-forging process in this range of sizes. All sized nuts can be formed at the rate of forty-two per minute on this one machine. The machine, which has been nick-named "Big Bertha," is more than 21 feet long, 10 1/2 feet wide, and 8 feet high. It weighs 125 tons, is driven by a 100-H.P. electric motor, and is equipped with an air clutch.

Hot-formed and pickled steel bar stock is employed for most of the nuts produced in this way. The steel (A.I.S.I. C-1109) has a carbon content ranging from 0.08 to 0.13 per cent and a manganese content of 0.60 to 0.90 per cent. The cold-working required to shape the stock produces a nut having higher yield and tensile strengths and lower ductility. However, the cold-working must be limited to an amount that will provide an economical die life and keep scrap at a minimum. Physical properties of the stock from which the nuts are made must be controlled to obtain specific properties in the nut.

Results of tests conducted with cold-formed hexagonal nuts made from the type of steel mentioned, (not heat-treated) compared favorably with those obtained in tests of conventional nuts made from X-1335 steel, heat-treated to a Brinell hardness of 325. Both types of nuts were 1 1/8 inches across the flats and 1 inch thick. In a pull test, with a hardened nut threaded on a hardened bolt, failure occurred under a load of 57,200 pounds. With the cold-formed nut, failure did not occur until the load reached 65,000 pounds. The hardened nut, however, proved to be stronger than the cold-formed nut when fewer threads were in engagement.

As previously stated, substantial savings have been effected in the cost of raw materials, the price of round stock being considerably less than that of hexagonal stock. For example, the cost of steel for one million nuts of a certain size was $18,000 for hexagonal stock and only $12,000 for round stock—a saving of 33 per cent on material

alone. Certain special nuts have been cold-formed from silicon-bronze stock on this machine.

The cold nut-forming machine is provided with a hydraulic straightener, seen in the right foreground of the heading illustration. With this attachment, "down time" required for feeding stock into the machine from a new coil is reduced to a minimum. A length sufficient to pass through the "de-kinker" rolls and into the feed-tube is mechanically straightened and pushed into the machine.

The straightening device is equipped with a double stock reel, supported on a car that travels on a track frame. Heavy V-grooved gripping jaws are mounted on one end of the stationary track frame, and both the car and jaws are hydraulically actuated. With a butt end of the raw material held in the gripping jaws, the car holding the coil is retracted the length of the track (about 80 inches), thus straightening the required length. This straightened length is then brought into position for feeding, and the car is advanced to force the stock through the feed-tube and into the first-station die.

When one coil has been completely used, the reel head is rotated through an angle of 180 degrees to bring the second coil into the operating position. The material in one coil can be "de-kinked" while the second coil is being fed into the machine. Prior to cold-forming, the coils, each of which weighs about 800 pounds, are dipped into a heated solution of wax and water.

The wax is a special compound made by the Gilron Products Co., Cleveland, Ohio. Upon removing the coils from the bath, the solution dries, leaving a residual coating that acts as a lubricant to assist in cold-forming and minimize scoring of the dies.

Successive shapes formed in producing one size of special nut are shown in Fig. 2. At the first or cutting-off and squaring station, slug *A* is produced. The stock is fed through a quill into a cam-actuated, vertically reciprocating cutter-block. The length of material fed is controlled by an adjustable stop-gage mounted in the cutter-block.

When the cam-actuated cutter-block rises, a slug is sheared and carried up to the squaring position. Here a punch, mounted on the horizontally reciprocating head of the machine, exerts pressure through the stop-gage in the cutter-block to compress the slug against the bottom of the squaring die. The slug is thus "filled out," or enlarged, and shortened. The squaring die is held in a block above the feed quill, the block being mounted on the stationary tailstock.

Fig. 1. Cold-forming machine that automatically converts coiled bar stock into nut blanks at the rate of forty-two per minute. Loading and unloading end of machine is shown in heading illustration

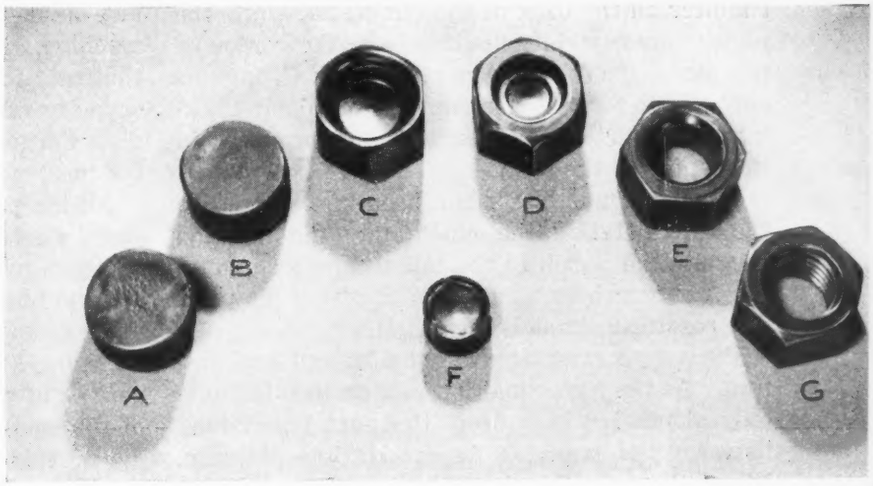


Fig. 2. Successive shapes (A) through (E) produced in cold-forming nuts. The slug resulting from the piercing operation is shown at (F) and the completed nut at (G)

The squared slug is ejected from the die into transfer fingers by means of a positive knock-out pin as the traveling head returns. Four sets of these V-shaped transfer fingers pivot simultaneously through an angle of 180 degrees to pick up and carry the progressively formed blanks from station to station. The endwise positions of the parts are reversed at alternate stations.

The second-station punch pushes the round slug from between the transfer fingers into a die when the head advances again. This die, which is roughly hexagonal in shape, produces the form shown at *B* in Fig. 2. Upon the return of the head, a knock-out pin in the bottom of the second-station die ejects the part into another pair of transfer fingers. In the meantime, the first pair of fingers has pivoted back to pick up another sheared slug at the first station.

At the third station, where most of the cold-forming is done, the punch pushes the slug from between the transfer fingers and into the die. An insert in this die forms a 3/32-inch 45-degree

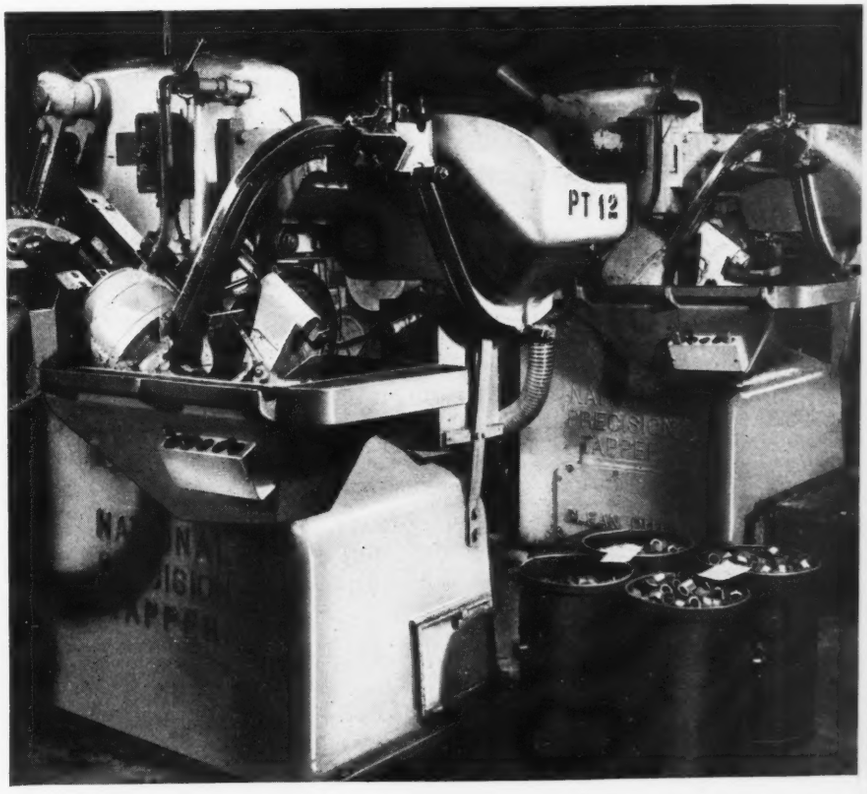


Fig. 3. Nut blanks are threaded on automatic hopper-fed tapping machines. Two of the tappers are required to handle the output of the forming machine. The completed nut may be seen at (G) in Fig. 2

chamfer on the back of the nut blank, while the punch forces metal outward from the center of the part. The formed part, seen at *C*, is thus enlarged to form a hexagon. A hole about 13/16 inch in diameter by 1/2 inch deep is produced in the center of the slug.

When the nut blank has been transferred to the fourth station, the punch and a die mounted opposite the punch in the tailstock, sizes, chamfers, countersinks, and starts to pierce the part. The resulting shape is seen at *D*.

Piercing is completed at the fifth and final station. As the hexagonal impression in this die is only about 1/8 inch deep, the part is retained between the transfer fingers during piercing. When the traveling head is retracted, the nut blank stays on the piercing punch until it is stripped off. The completed cold-formed nut blank falls down a chute into a container located at the operator's side of the machine.

The slug pierced from the nut blank is pushed into the round bore of the die and is gripped by three ball detents to prevent its being pulled back with the nut blank. Successive slugs are forced into a disposal chute and carried out at the loading end of the machine. The nut blank, as seen at *E* in Fig. 2, is slightly expanded in this piercing operation. The slug pierced from the blank is shown at *F*.

Since all the cold-forming operations at each station are carried on simultaneously, a complete nut blank is produced with each stroke of the machine. As previously mentioned, the production rate for this and other nut sizes within the capacity of the machine, is forty-two per minute. Scrap loss amounts to less than 10 per cent for most nut sizes.

All the punches and dies are made from high-speed steel, hardened and ground. The transfer fingers, which pivot about vertical spindles mounted between adjacent working stations, are made from cold-rolled steel. A sulphurized-base cutting oil, mixed in the ratio of 1 gallon to 10 gallons of paraffin-base oil, is directed onto each of the cold-forming punches.

The cold-formed nut blanks are threaded on the National 1-inch high-speed precision tappers seen in Fig. 3. Two of these machines are required to handle the output of the nut-forming machine. The nut blanks are dumped into the hopper of the threading machine, where they are automatically fed through a sorting mechanism that insures that the nuts will be delivered to the chute proper end first. They are fed over the tap with the bottom face against the plunger type injector to insure that the nuts are tapped square with the bottom face. The nuts continue feeding around the hook-shaped tap, through an angle of 180 degrees, and fall down a discharge chute into a container. A completed 1-inch nut with 8 threads per inch, U.S.S. form, is seen at *G* in Fig. 2.

Machine Tools Supplied Russia of No Military Value?

THE American public was understandably disturbed when Winston Churchill recently disclosed to the British Parliament the fact that England is selling machine tools to Russia. But America will be even more shocked by the disclosure of the Machine Tool Builders' Association that France, Italy, and West Germany have also been sending machine tools in considerable volume to the Soviet Union and its satellite countries. Furthermore, in spite of Churchill's criticism of the policy, the Labor Government of Great Britain has announced that it will not halt the export of machine tools.

Our money has made this possible because Great Britain, France, and Italy have been aided financially through the billions of dollars given them by the Economic Cooperation Administration. In Italy, E.C.A. helped to finance machine tool production with a view to promoting post-war rehabilitation. Today, there are more manufacturers of lathes and vertical drilling machines in that country than in the United States. Italy does not have need for anywhere near the output of those plants. Where are the excess machines going?—Behind the Iron Curtain!

West Germany has been building machine tools under the Recovery Program financed by the United States, and has shipped these machines to Russia's satellite countries with permission granted by American military authorities. Horizontal boring mills have gone to Poland and grinding machines to Hungary.

Protests have been made from time to time to the Department of State, the Department of Commerce, the National Security Resources Board, and the heads of our Armed Forces—without avail. And now, E.C.A. officials contend that most of the machine tools which have gone behind the Iron Curtain have no military value. There is no such thing as a machine tool of no military value—the very simplest types are essential to the production of aircraft, guns, tanks, bullets, and other fighting materiel. And how about heavy boring mills?

It is appalling to think that the tanks, guns, and ammunition being used by our enemy in Korea were probably produced with the aid of machine tools built in plants financed by money that was made available through taxes paid even by the parents of the boys fighting in Korea. Our own machine tool industry is guiltless because American-built machine tools have not been shipped to Russia or any of her satellite countries for more than two and one-half years.

Conditions should be imposed on the machine tool builders of all countries enjoying our bounty to prevent them from supplying any equipment that could be of help in building up the fighting potential of the Soviet Union.

The situation demands immediate corrective action!

Charles O. Herb

EDITOR

Materials and Equipment for High

THE thirty-second National Metal Congress and Exposition—commonly known as the Metal Show—will be held in the International Amphitheatre, Chicago, Ill., October 23 to 27, inclusive. Because of the fact that greater productivity is of utmost importance in the present national emergency, emphasis will be placed at the Show and in the various technical sessions upon materials and equipment for higher production. Approximately 350 exhibitors will promote this theme by bringing their latest developments to the attention of industry.

As in previous years, this annual show is being sponsored by the American Society for Metals; the American Welding Society; the Metals Institute Division of the American Institute of Mining and Metallurgical Engineers; and the Society for Non-Destructive Testing. Technical sessions of these Societies will be held in the Hotels Palmer House, Sherman, Sheraton, and Morrison.

The American Society for Metals and the American Welding Society will hold morning, afternoon, and evening sessions throughout the week. The Metals Institute Division of the American Institute of Mining and Metallurgical Engineers will have day and evening sessions Monday through Wednesday. The Society for Non-Destructive Testing has scheduled morning and afternoon technical meetings on Tuesday, Wednesday, and Thursday.

The ASM educational program will include three series of lectures on Monday, Tuesday, and Wednesday, October 23, 24, and 25. The subjects will be: "High-Temperature Properties of Metals"; "Interpretation of Tests and Correlation with Service"; and "Metallurgy of Titanium."

The ASM will also hold a seminar on atom movements on the Saturday and Sunday preceding the Show. Another feature being promoted by the Society will be a metallographic exhibit, which will comprise micrographic studies of cast iron and steel, tool steels, alloys, light and nonferrous metals, stainless steels, etc., both in photograph halftones and transparencies.

An event of outstanding interest will be a business forum participated in by management executives from both the metal-producing and metal-consuming fields. Producers of raw materials will report on the prospects for continued high-level output; the needs and opportunities for expanding plant facilities; and the more critical implications of domestic and foreign supply should the present atmosphere of world tension grow worse. Consumers of metals representing the automotive, railroad, agricultural-equipment, chemical, and electrical industries will discuss means of adjusting their business objectives to meet the new conditions. The proceedings of the business forum sessions will be directed by Earl R. Shaner, editor-in-chief of *Steel*. Sales clinics will also be held, in which consideration will be given to the general aspects of selling and marketing within the metal-working field.

Among the papers to be presented at the technical sessions that will be of especial interest to production men in metal-working shops are: "A Hardenability Test for Deep-Hardening of Steels," by William Wilson, Jr., research metal-

(Left) Walter E. Jominy, staff engineer, Chrysler Corporation, who will be president of the American Society for Metals for the year 1950-1951

(Right) Harry W. Pierce, assistant to the president, New York Shipbuilding Co., who will be president of the American Welding Society, 1950-1951

Production—Theme of Metal Show

lurgist, Armour Research Foundation; "An Examination of the Quenching Constant H," by D. J. Carney and A. J. Janulionis, Carnegie-Illinois Steel Corporation; "The Tempering of Chromium Steels," by R. W. Balluffi, Research Laboratory, Sylvania Electric Products, Inc., Morris Cohen, Professor of Metallurgy, and B. L. Averbach, Assistant Professor of Metallurgy, Massachusetts Institute of Technology; "Hot-Forming of Aluminum and Magnesium Alloys," by T. E. Piper, chief process engineer, Northrop Aircraft, Inc.; "The Powder Metallurgy of Beryllium," by H. H. Hausner, section head, and Norman P. Pinto, senior engineer, Sylvania Electric Products, Inc.; "Grindability of Tool Steels," by L. P. Tarasov, Research Laboratories, Norton Co.; "The Nickel-Molybdenum-Vanadium Alloy Steel Shielded Arc-Welding Electrode," by W. H. Wooding, Philadelphia Naval Shipyard; "Aluminum-Magnesium Filler Metals for Welding High-Strength Aluminum Alloys," by R. D. Williams and D. C. Martin, Battelle Memorial Institute; "The Rotary Electrode for Manual Metallic Arc-Welding," by Professor Gilbert S. Schaller, University of Washington; "New Production Applications of Hard-Facing," by Eldon C. Hurt, Haynes-Stellite Division, Union Carbide and Carbon Corporation; "The Present Status of Composite Metal Fabrication for Arc-Welding," by H. E. Cable, Lincoln Electric Co.; "Commercial Flame-Hardening," by E. J. Cox, Pittsburgh Commercial Heat Treating Co.; "Flame-Hardening of Large Surfaces," by J. J. Barry, Air Reduction Sales Co.; "Production Flame-Hardening," by Milton Garvin, Cincinnati Milling Machine Co.; "A Practical Method for Obtaining Consistent Resistance Welds," by J. W. Kehoe, Westinghouse Electric Corporation; "Resistance Spot- and Seam-Welding of Aircraft Materials Using Direct Current," by J. H. Cooper, Taylor-Winfield Corporation; "New Flash-Welding of Non-Ferrous Materials," by F. L. Brandt, Jr., Thomson Electric Welder Co.; "Inert Arc-Welding of Non-Ferrous Metals," by John W. Mortimer, Whitlock Mfg. Co.; "The Effect of Welding on the Properties of Titanium-Carbon Alloys," by E. M. Mahla and R. B. Hitchcock, E. I. du Pont de Nemours & Co.; "Aircomatic Welding of Copper-Base Alloys," by Harold Robinson and J. H. Berryman, Air Reduction Co., Inc.; "Heliarc Welding in Production," by T. E. Piper, Northrop Aircraft, Inc., "Jigs and Fixtures for Inert-Gas Arc-Welding," by H. A. Huff, Jr., and A. N. Kugler, Air Reduction Sales Co.; and "Suggested New Welding Standards," by J. F. Lincoln, Lincoln Electric Co.

The Albert Sauveur Achievement Award will be presented to Clarence E. Sims, Assistant Director, Battelle Memorial Institute, for his pioneering studies and sound research into the origin and effect of inclusions in cast steels.

* * *

One steel company's program to supplement the iron ore supply necessary for the production of steel provides for the development by 1970 of an annual capacity of 25,000,000 tons from new sources.

(Left) Maxwell Gensamer, assistant to director of research, Carnegie-Illinois Steel Corporation, and chairman of Metals Institute Division of the American Institute of Mining and Metallurgical Engineers

(Right) Phillip D. Johnson, national secretary of the Society for Non-Destructive Testing

Condensed Review of Some Recently Developed Materials

Arranged Alphabetically by Trade Names

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Thermo-setting Resin Adhesive	**Adhesive A-1**	A resin mixture containing no volatile constituents and which does not shrink or swell upon hardening. Materials may be bonded together immediately after application of the adhesive.	For bonding aluminum to other metals which are to operate at temperatures up to 200 degrees F.; repairing broken aluminum castings; bonding plastic sheet materials to aluminum and steel; caulking fabricated aluminum-alloy tanks; etc.
Industrial Ceramics	**AI-200 Alumina**	One of several high-strength industrial ceramics with high heat resistance. These ceramics also have good resistance to corrosion and abrasion, low coefficient of friction, and high compression strength.	For high-pressure use in valve parts and bearings. Also employed for grinding balls, nozzles, extrusion dies, surface plates, plug and ring gages, and pump parts.
Hard-facing Alloys	**Aircolite** **Airco Self-Hardening Alloy**	Two of a group of fifteen hard-facing alloys that may be divided into three types—ferrous alloys, cobalt-base alloys, and tungsten carbides.	Aircolite is especially recommended for equipment subjected to severe abrasion and medium impact, such as pulverizer hammers and core crusher rolls. Airco self-hardening alloy is for equipment subjected to severe impact and severe abrasion, as, for example, bucket teeth and sizing screens.
Hard-facing Alloy	**Aircolite 59**	An alloy of chromium, molybdenum, carbon, and iron in rod form, having a low coefficient of friction and capable of maintaining high hardness at temperatures up to 800 degrees F.	This alloy, in bare form, is used for oxy-acetylene, hard-facing operations and, in coated form, for electric application in steel mills, foundries, and metal-working plants.
Cleaning Compound for Aluminum Stampings	**Alkalume No. 1**	An effective cleaning bath that removes heavy coats of polishing composition from aluminum stampings. Removal of soil is accomplished without scrubbing by immersing the work in the bath for two to five minutes.	Cleaning of aluminum parts which have become coated with polishing composition.
Nickel-silver Brazing Rod	**All-State No. 11**	A flux-coated nickel-silver brazing rod for use with the oxy-acetylene blowpipe.	For brazing operations on various metals where bronze rod is normally used.
Aluminum Brazing Wire	**Aluminum Brazing Wire No. 718**	Joints made with this wire are resistant to corrosion and leaks.	For aluminum brazing applications requiring that the joints have resistance to corrosion.
Aluminum Wire	**Aluminum Redraw Rod and Round Drawn Wire**	Both of these products are made in 2S, 3S, 52S, 61S, 43S, and 150S aluminum alloy. These grades are made in 3/8-inch annealed and as-fabricated tempers (O and F) of redraw rod and round drawn wire. Round drawn wire is also supplied in coils with standard tempers and diameters ranging from 0.051 to 0.250 inch.	For products where fine appearance is desirable, 150S rod and wire are recommended.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Pattern Plastic	**ARD-Lustrex 15K**	This plastic can be molded in cast molds at the low pressures usually available in wax-mo'ding machines. Patterns made from this material do not require care in handling and may be stored without danger of distortion. In drying and firing, no mold cracks result, due to controlled expansion properties of the plastic; no burning need take place within the mold, and no ash is left after firing.	For use in precision investment casting.
Stainless Steel	**Armco 17-4 PH Stainless Steel**	A stainless steel of high hardness, strength, and corrosion resistance, requiring only a low-temperature (850 to 1000 degrees F.) hardening treatment. An easily removed surface discoloration is produced in the precipitation hardening of this steel, and, therefore, grinding or finishing operations such as are ordinarily required for heat-treatment are unnecessary.	For gears, cams, shafting, chains, valves, and pump parts requiring high mechanical properties and corrosion resistance better than obtainable with present hardenable grades of stainless steel.
Bearing Bronze	**Asarcon 773**	Continuous-cast bearing bronze having 83 per cent copper, 7 per cent lead, 7 per cent tin, and 3 per cent zinc to meet S A E 660 specification. The continuous cast process insures a dense, solid metal, free from porosity.	For use in bearings.
Ground Flat Stock	**B & S Ground Flat Stock**	Ground flat stock hardenable in oil as well as water; available in sixteen thicknesses and in widths up to 6 inches, all 18 inches long.	Useful in the tool-room for the construction of jigs, fixtures, and dies.
Tool Steel	**B-47 Hot Work Steel**	An alloy designed for hot-working, composed of chromium, tungsten, cobalt, vanadium, and iron, which has excellent resistance to shock and abrasion at elevated temperatures.	For brass extrusion dummy blocks and dies, valve extrusion die inserts, forging die inserts, forging press dies, and hot punch tools.
Phenolic Plastics	**Bakelite C-22**	These plastics have curing rates 45 per cent faster than those of previous phenolics, a high gloss, and excellent mold release characteristics.	For fast-curing compression and plunger molding in positive or semi-positive molds.
Wire-drawing Compound	**Banox**	Phosphate material that inhibits rust and helps lubricate wire in process of manufacture. Said to permit 20 to 25 per cent increase of speed in drawing fine high-carbon wire.	This material is applicable where protection of wire against rusting, increase in wire drawing speed, and reduction of damage to dies and wire are called for.
Metal Enamel	**Base Y2054**	A synthetic protective coating which produces a hard surface with high resistance to alkalies, fats, grease, and smoke. Products finished with it may be handled within fifteen minutes.	Used as a coating where a surface that can be polished to a glossy finish is required.
Bonded Shim and Brazing Alloy	**Bondwich**	A shim which combines steel and brazing alloy in a single shim to reduce alignment problems in the brazing of inserted carbide tips.	For brazing inserted carbide tips on various cutting tools.
Silver Brazing Rings	**Brazing Rings, Notched-Coil**	A spring-like coil which is notched so that individual rings may be quickly and easily detached for brazing and soldering operations.	For mass-production brazing and soldering operations, where easily detached brazing rings help to reduce assembly time.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Burnishing Compound	**Burnish-All**	A compound which produces a brilliant luster on most metals and their alloys.	To produce a brilliant luster on metal surfaces. May be used with a burnishing medium or in self-rolling operations.
Cemented Carbide	**Carboloy No. 905**	A cemented carbide having higher hardness, greater wear resistance, and greater cutting edge strength, as well as providing more rapid heat dissipation at the cutting edge, than former No. 905 grade.	For light roughing and finishing cuts on non-ferrous metals and cast irons with hardness up to 550 Brinell.
Carburizing Paste	**Carburit**	A paste for rapid casehardening of steel. Hardness produced compares favorably with that obtained by other methods. Rapid penetration is obtained.	Readily used for selective hardening. No special equipment required. Any source of heat can be used. Particularly suitable for repair work.
Sintered-carbide Alloy	**Carmet Grade CA-51**	Typical cutting data for planer tools of this material when cutting 60 per cent semi-steel casting: Depth of cut, up to 1 1/2 inches; feed, 0.100 inch; surface speed, 175 feet per minute.	Especially designed for high-speed planer tools. Other applications are tool blanks for heavy turning, boring, and facing.
Stainless Steel	**Carpenter Stainless No. 10**	An 18 per cent nickel, 16 per cent chromium stainless steel having corrosion resistance as good as that of conventional stainless steels 302, 304, and 305, but which work-hardens at a slower rate than the conventional 18-8 types.	For the economical production of cold-headed stainless-steel bolts, nuts, and other parts that require severe cold-coining and extrusion.
Casting Alloy	**Cerrocast**	A low-temperature alloy having negligible shrinkage and an extensive melting range. This alloy of bismuth and tin, which melts at 281 to 338 degrees F., has a density of 0.296 pounds per cubic inch, a Brinell hardness of 22, and shrinkage of 0.0001 inch per inch.	For parts which must be accurately coined to reproduce fine surface details of a master pattern. It may also be used in spray guns and for low-temperature soldering of pre-tinned metal parts.
Inert Packing Material	**Chemlon**	This material has the chemically inert properties of the familiar braided packing and is not attacked by acids or alkalies.	For acid- and alkali-resisting packings exposed to temperatures up to 450 degrees F. This material is available in the form of molded washers, bushings, self-sealing vee cross-section rings, gaskets, and other shapes.
Strippable Coating	**Chem-Peel**	Strippable protective coating which, after application in the form of an emulsion, dries to a protective plastic film.	Can be used on spray-booth walls as a coating to permit ready removal of overspray. Also protects metal parts from corrosion, dirt, and surface injury.
Pulley Lagging	**Condersite**	All-purpose waterproof pulley lagging readily applied without rivets, bolts, or heat. Unaffected by weather and resists attack by sulphuric acid, soaps, alcohol, and petroleum products.	Provides superior frictional resistance and increased transmission efficiency for crown, split, or flat pulleys when used with leather, cord, wire-woven, or rubber belts.
Transparent Plastic	**Crystal Tenite II**	New transparent form of Tenite II.	For use in products that require transparency approaching optical clarity.
Copper Brazing Paste	**Cubond**	Copper in paste form for assembling parts by furnace copper brazing. The paste is applied by means of a gun.	A substitute for rings, foil, slugs, and electroplate in furnace copper-brazing operations.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Plastic Lining	Cycloflex PC-11	A plastic that sets to a rugged, chemically inert membrane, highly resistant to inorganic acids, alkalies, grease, oxidants, and cleaners.	Available in white or black for coating the inside of drums or tanks.
Plastic Coating	Cyc-Lon Series NPC	Easily applied synthetic paint that dries quickly in air by solvent evaporation, forming an adhesive, hard wearing, flexible glossy coating. Requires no surface priming.	For protecting metals, wood, and ceramic surfaces against chemical attack by corrosive fumes, condensates, etc.
Silicone Coating Aluminum	Dampney Silicone Coating	A silicone coating aluminum having high inertness, heat stability, water repellence, and low moisture absorption, which provides a heat- and weather-resistant surfacing material.	For out-of-doors service in industrially contaminated atmospheres, as well as for application to such equipment as stacks, furnaces, boilers, heaters, steam lines, etc.
Corrosion-resistant Coating	Dampney Vinyl Resin Coating	A corrosion-resistant vinyl resin coating which is applied by brushing or spraying. This material resists alkalies and mineral acids, and is insoluble in alcohols, greases, oils, and aliphatic hydrocarbons.	For durable as well as decorative surface finish applications for service over an operating temperature range of —40 degrees F. to 160 degrees F.
Metal Lacquer	Dennis No. 5062	This lacquer will withstand twenty-four-hour immersion in gasoline and fifteen-minute immersion in hot oil (275 degrees F.) without apparent deterioration of film strength or gloss.	For use on metal surfaces where oil resistance, toughness, and maximum adhesion are required.
Cleaner and Coating Compound	Detrex 79	Yellow, non-corrosive cleaning and phosphate coating material in powder form. Used in heated water solutions at low concentrations, it produces a high crystalline phosphate film.	Used to provide a base coating on steel and other metals preparatory to painting.
Die-casting Die Lubricant	Die Slick No. 9	A die lubricant which may be applied by brushing or spraying and which will not stain the casting. As this lubricant leaves no carbon, gum, or other residue in the die, the necessity of frequent cleaning of dies is eliminated.	To prevent scoring and sticking of pressure die-casting dies.
Spray Booth Cleaner	Differentiated Klarifiant	A non-foaming compound which keeps the hydraulic system of spray booths clean.	For down-draft water-wash spray booths.
Metal Primer	Di-Noc Metal N33	A primer which has good adhesion to aluminum without special preparation, as well as high abrasion resistance.	For aluminum surfaces which are to be subsequently finished with lacquer, enamel, or other standard finishes.
Liquid Detergent	Drex Foam	Liquid cleaning compound with effective cleaning and wetting properties that leaves no streaks, smears, or other blemishes and contains no abrasives or harsh alkalies.	Intended for use as a general-purpose cleaner and for removing dirt, grease, and grime from automobiles, trucks, and aircraft.
Magnesium-treated Cast Iron	Ductile Cast Iron	A cast iron that combines the fluidity, castability, and machinability of ordinary cast iron with the advantages of cast steel.	For use wherever castings with high elasticity, yield strength, and ductility are required.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Ductile Cast Iron	**Ductile Cecolloy**	A spheroidal cast iron which has many of the desirable properties of cast steel and most of the advantages of cast iron, including shock dampening characteristics. The wear resistance is above that of both cast iron and cast steel, and induction hardening is practical.	For castings requiring the ductility and strength of steel and the shock dampening characteristics of cast iron.
Mineral-filled Molding Compound	**Durez 14893 Black**	A phenolic molding compound possessing heat resistance, good finish, fast curing, and low specific gravity. It may be molded by the compression or plunger method.	Suitable for molding around inserts and for applications where prolonged high temperatures are encountered.
Diamond Lapping Compound	**Dymo**	A diamond compound which resists caking or drying out and maintains a uniform suspension of abrasive particles.	For industrial lapping and polishing operations.
Screw Steel	**E Steel**	Screw steel available in cold-finished bar form with machinability index as high as 170. Shows better finish after machining and has better cold-working and cold-forming properties than standard Bessemer screw steels.	For use in manufacture of nuts, screws, studs, fittings, and other screw machine products.
Vibration-isolating Material	**Elasto-Rib**	Laminated material consisting of a layer of cork bonded between layers of deep-grooved, oil-resistant synthetic rubber.	For low-cost vibration and noise control. Recommended loading 7 to 21 pounds per square inch.
Stable Graphite Film	**Electrofilm Graphite**	A stable graphite film, 0.00015 to 0.0005 inch thick produced by a special treatment. Has excellent resistance to abrasion and high bearing strength. The graphite is applied by spraying or dipping, following surface preparation.	For use on metal, plastics, rubber, and ceramics.
Spring Alloy	**Elgiloy**	Non-magnetic corrosion and fatigue-resistant spring alloy.	For use both in springs and in corrosion-resistant valves.
Corrosion-resistant Coating	**End-O-Rust Coating**	A quick-drying coating which resists corrosion stimulated by dampness and salt air. No surface preparation is necessary.	For metals, wood, fiber, concrete, and other surfaces.
Plastic	**Enrup**	A high-strength plastic that is resistant to abrasion and chemicals. It is available in varying degrees of flexibility, ranging from elastic soft rubber to brittle hard rubber.	For the manufacture of high-strength, low-cost gears; replaces metal gears in heavy-duty lathes, household appliances, plating barrels, automotive timing devices, and dynamometers.
Metal Stripper	**Enthone**	Compound for dissolving nickel and other metal coatings on steel without attacking the steel. The stripper is alkaline and requires no electric current.	Effective in removing nickel, copper plate, silver, cadmium, and zinc from steel. Not suitable for removing nickel coatings from zinc-base or copper alloys.
Plastic Plating-rack Coating	**Enthonite 101**	Plastic coating supplied as a viscous liquid containing 100 per cent solids with no solvents to evaporate. Coating is tough, resilient, and has high resistance to all types of inorganic solutions.	For application to plating racks in coatings from 1/8 to 1/4 inch thick.
Welding Alloy for Zinc Die-castings	**Eutec-Die Cast-Weld and Eutector Flux**	A low melting point alloy that permits welding without fusion or puddling of the base metal. It bonds at 600 degrees F. and provides a color match when applied to zinc die-castings.	For gas welding of zinc die-castings.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Nylon	**FE-1044**	Pliability combined with good wear resistance. Has many properties of rubber, with excellent chemical resistance to hydrocarbons.	For seating disks in low-pressure valves and gaskets in contact with oil, gasoline, or various hydrocarbons.
Drawing Compound	**Fluid-Film**	A drawing compound unaffected by atmospheric conditions. It can be applied by brushing, spraying, rolling, or dipping, and leaves no stain after removal with hot water or alkaline cleaner.	For stamping operations on ferrous and non-ferrous alloys in press rooms.
Rare Metal	**Gallium**	Rare silvery-white metal with melting point of 86 degrees F. Wets many types of non-metallic surfaces, such as glass. Similar in chemical behavior to aluminum, but has about twice its density.	Because protective natural oxide film forms readily on surface, a globule of Gallium will remain bright and shiny at temperatures up to 1000 degrees F.
Rubber Molding Compound	**G-E 12446**	High shock resistance due to toughness and resiliency of Hycar-American rubber used in the compound. Also has good moldability, heat resistance, and thermal shock resistance.	Can be molded around large complex inserts without danger of cracking, and around inserts subject to flexing and vibration.
Silicone-glass Molding Compound	**G-E 12810**	A compound having high resistance to heat, impact, and arcing, as well as good flow in the mold.	For circuit-breakers, switch-gear, and other parts subjected to extreme heat and impact.
Laminated Phenolic	**Grade L-RF Laminated Phenolic**	A laminated phenolic with exceptionally high impact fatigue values and superior machinability.	For applications requiring a phenolic material of high impact fatigue, strength, and good machinability.
Hydraulic Equipment Oil	**Gulflite 5W**	An oil with a viscosity of 90 to 100 Saybolt universal seconds at 100 degrees F. This oil maintains its body, load-carrying capacity, non-foaming, and free-flowing characteristics throughout the temperature range at which hydraulic equipment is normally operated.	For hydraulic pumps and similar equipment which either generates high temperatures or is used in sub-zero weather.
Heavy-duty Industrial Grease	**H Grease O**	A soft grease for winter use, which has a lime-soap base and is particularly suitable for low-temperature applications.	For service where higher viscosity mineral oils are required than are provided in ordinary cup greases.
Case-hardening Compound	**Hard-N-Deep**	A compound that quickly produces a carburized surface which is tough and uniform without appreciable change in surface dimensions.	For casehardening steel. Parts are heated, dipped in the compound, reheated, and quenched.
Hardening Compound	**Hi-Speed-It**	Steel hardening compound in powder form that can be readily applied without special equipment.	Cutting tools, dies, taps, reamers, drills, and files can be treated by dipping or rolling in the compound after tools have been heated to required temperature. Quenching is accomplished in cold water or brine.
Cold-drawing Compound	**Houghto-Draw 357**	A heavy paste containing high melting point waxes and fats with a colloidal pigment. It is applied by immersion of the work in a water solution of the compound.	For cold-drawing of hot- or cold-rolled bars. Bars drawn with the aid of this compound have a brighter finish and smoother surface than those drawn using a lime coating.
Liquid Solvent	**Hydro-Solv A**	Is composed of several highly active gum and sludge solvents. Its use makes unnecessary the draining, flushing, and cleaning of a contaminated hydraulic system.	For use in hydraulic oil systems to carry gum and sludge into suspension or solution.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Inconel	**Inconel T-sections**	These hot-rolled Inconel T-sections are made in a standard size, 1 1/2 by 1 1/2 inches by 1/4 inch, and in lengths up to 15 feet. The weight is about 2 3/4 pounds per foot.	For furnaces and other high-temperature equipment.
Lubricating Oil	**Instrument Oil (Special) and Micro-Bearing Oil**	Both oils have non-spreading qualities which enable them to "stay put" over long periods of time. They possess low volatility and are resistant to oxidation.	For precision bearings of the pivot-to-jewel or pivot-to-brass type.
Isolating Paste	**Isopac**	Prevents penetration of carbon gas to metal surfaces and also prevents rapid cooling. Easily removed after work is quenched.	For protection of selected areas of work to be kept soft during casehardening.
High-temperature Thermoplastic	**Kel-F**	Unusually stable, high-temperature thermoplastic with satisfactory properties in the temperature range of —320 to 390 degrees F. It is colorless and transparent, but can be blended with solid fillers and coloring agents. Has low cold-flow characteristic.	For pump packings, valve seats, and valve packings subject to corrosive gases and liquids, and pump diaphragms where a resilient material is required.
Rust Inhibitive Paint	**Kem-Ban**	A paint which provides rust inhibiting action and resistance to acids, alkalies, salts, and other chemicals. It adheres to all metal surfaces including polished ones.	As a protective maintenance coating.
Chromium-plated Steel Rods	**Kenmore Chromium-Plated Rods**	Chromium-plated steel rods which have a bright, corrosion-resistant finish and can be bent, formed, spot-welded, butt-welded, or swaged without damage to the chromium-plated surface.	Suitable for the manufacture of parts for furniture, bicycles, typewriters, refrigerators, racks, and other formed-rod applications. Available in diameters from No. 11 American wire gage to 5/16 inch and in all commercial lengths.
Carbide Tubes	**Kennametal**	Tungsten-carbide and titanium-carbide tubes as small as 1/32 inch outside diameter with inside diameter of 0.004 inch, and as large as 9/16 inch outside diameter with wall thickness of 1/16 inch.	Tungsten-carbide tubes are used for parts subject to abrasion at normal temperatures, such as wire guides, orifices, nozzles, punch and die parts, etc. Titanium-carbide parts are used for high-temperature applications, such as furnace rollers, guide bushings for hot rods, nozzles, burner cones, etc.
Plastic Pipe	**Kralite**	Corrosion-proof plastic pipe made of a blend of synthetic rubber and thermoplastic resins. Can be bent to various radii and can also be threaded for fittings.	For use in chemical manufacturing, mining, or other industries where resistance to chemical attack and weather is required.
Plastic Protective Coating	**Krylon**	Dries in less than a minute, leaving clear satin finish, resistant to discoloration at high temperatures and to action of water, alcohol, acids, alkalies, mineral oils, grease, and chemical fumes.	For protection of initial parts during storage. Also useful in protecting fine instruments and tools against corrosion.
Cold Solder	**Lab-Metal**	Hardens rapidly into a strong permanent bond that can be sanded to a feather edge, ground, and painted. Can be thinned with any regular lacquer thinner.	For filling blow-holes, sand holes, surface blemishes, and rough or porous places in metal castings.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Free-machining Screw Steel	**La-Led**	A lead-bearing, cold-finished, open-hearth steel which has good ductility and free-machining properties. It carburizes better and has a sounder cross-section than Bessemer free-machining steels.	For applications requiring a free-machining steel which can be easily carburized and which has a more uniform cross-section than Bessemer free-machining steel.
Protective Coating	**Liquid Stainless Steel**	Liquid plastic containing flakes of stainless steel of microscopic size. Has good adhesion to wood, metal, and other surfaces, and is quick-drying.	For application to any surface by brushing or spraying.
Permanent Repair Alloy	**Lo-Temp**	Low-temperature, bronze-base permanent repair alloy. Can be handled like putty at 300 degrees F., and fuses with metal surface under repair. Will not corrode, crumble, shrink, or dry out.	For use in industrial repair and maintenance operations. Can be applied to any metal except aluminum and its alloys.
Lubricant for Hydraulic Systems	**Lubeway**	Dual-purpose oil which has the stability and non-sludging characteristics of a good hydraulic oil, and also possesses the metal wetting and extreme pressure qualities of a good way lubricant.	For use in hydraulically operated machine tools in which way lubricant is fed by pressure from the hydraulic system.
Metal Cleaners	**Matawan 20-W** **Matawan 25** **Matawan 30** **Matawan 30-W** **Matawan 50-W**	The first of this series of metal cleaners is a mild non-etching cleaner; the second, a non-silicated medium-caustic base cleaner; the third, a silicated medium-caustic base cleaner containing no foaming or wetting agent; the fourth, a silicated medium-caustic base cleaner containing a suitable wetting agent; and the fifth, a non-silicated high caustic type cleaner.	Matawan 20-W is used for the soak cleaning of aluminum or as a soak or cathodic cleaner for zinc-base die-castings and brass parts. Matawan 25 is designed for etching aluminum for appearance or to prepare for spot-welding or anodic paint coatings. Matawan 30 is for spray type washing of steel parts. Matawan 30-W is used on iron, steel, brass, or bronze as a soak or as an electro-cleaner. Matawan 50-W is used as a soak cleaner for magnesium.
Zincless Bronze Alloys	**Mixture 44**	A bronze alloy with high lead content but no zinc. Machinability of this alloy is 90 per cent of that of free-cutting brass, rated at 100 per cent. High lead content makes possible machining at higher cutting speeds and to closer tolerances.	For applications where bronze containing zinc cannot be used.
Dry Lubricant	**Molykote**	Dry lubricant consisting essentially of molybdenum disulphide powder. Has extremely low coefficient of friction and unusual capacity to prevent galling, seizing, or metal-to-metal contact at bearing pressures over 100,000 pounds per square inch.	Adheres tenaciously to smoothest surfaces with light rubbing. When used on screw fasteners or in press fits, assembly takes place smoothly, without binding, at increasing torque.
Emulsion Cleaner	**Mul**	Ready-to-use compound that combines solvent and emulsion cleaning properties with action of soil-penetrating agents. Resists hard water attack, minimizes curd formation, and is inhibited against foaming.	Can be used for washing, as an additive to rinse tanks, or as a dip. Also suitable for pre-wetting metal products before alkaline cleaning or vapor degreasing.
Degreasing Compound	**Mulsolv**	A synthetic emulsion degreasing agent which is non-toxic and requires no protective provisions to guard against dangerous fumes.	For use in standard cleaning equipment to remove grease from metal parts prior to assembly or shipment.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Welding Fluxes	**No. 3 No. 5 No. 7 No. 9**	**Brazing and welding fluxes for various metals.**	No. 3 is for brazing brass, bronze, steel, and clean cast and malleable iron. No. 5 does an excellent job of "tinning" dirty castings. No. 7 is for high-heat brazing of cast and malleable iron. No. 9 is for fast, effective welding of cast iron.
Color Buffing Compound	**6-B-72**	Bar composition with a binder that retains abrasive on buff face, permitting it to cut without building up a heavy waxy face.	For color buffing carbon steel, stainless steel, and chromium plate. Will also rapidly cut and color burned chrome.
Stainless Steel	**18-8 Stainless-Steel Strip**	An 18-8 bright-annealed stainless-steel strip which is cold-rolled up to 15 inches in width.	This 15-inch wide bright-annealed stainless steel strip makes it possible to fabricate many parts previously unobtainable in this material.
Liquid Cleaner	**No. 49**	Cold-spray cleaner which dissolves grease rapidly and evaporates quickly. It is inert to ordinary electrical insulating materials and has low flammability and mild toxicity.	For cleaning operations on machines, electric motors and generators, and general maintenance work.
Water-emulsion Wax	**No. 1568**	Rust-inhibiting and protective wax applied by conventional dipping, spraying, wiping, or flow-coating methods. It forms a dry wax coating, and is non-flammable and non-toxic.	For application on black-oxidized, phosphated, and untreated metal surfaces, as well as on painted and plated parts.
Bearing Bronze	**Non-Gran**	Non-granular bronze with needle-like structure that has greater toughness, resiliency, and longer service life.	For use in bearings.
Cold-solvent Material	**Oakite No. 15**	Cold-solvent material for removing baking japans, paint, and similar finishes from metal surfaces without attacking the metal.	May be applied at room temperature by tank immersion or by swabbing or brushing. Useful in production stripping of rejected parts.
Pre-paint Cleaner	**Oakite No. 33**	A liquid cleaner which contains acid ingredients that act on rust, heat scale, tarnish, and other oxides, and converts the surface layer of metal into a thin film of insoluble phosphates, providing an excellent bond for paint.	For use wherever rusted or tarnished surfaces are to be painted. This cleaner is applied by using soak tank or hand swabbing method.
Spray Booth Cleaner	**Oakite No. 45**	A material which prevents overspray from adhering to aprons, baffles, lines, and flood sheets of water-washed paint spray booths.	For keeping walls and working surfaces of water-washed paint spray booths clean and free of overspray.
Metal Primer	**Ospho**	Priming compound that causes iron oxide to change to iron phosphate, an inert, hard, dark gray substance. This compound provides an excellent bond for coats of paint.	For application directly over rusted metal surfaces.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Penetrating Oil	**Pen-a-trate 318**	A lubricant-base oil with a high degree of capillary action for penetration of rusted or "frozen" metal parts.	For application to threads, bushings, etc., before assembly to facilitate a smooth entry, faster run-on, and tight fit, while guarding against corrosion.
Metal-cleaning Shot and Grit	**Permabrasive**	A shot and grit that retains its original impact value for a long period.	For lower-cost abrasive metal-cleaning operations.
Stainless-steel Clad Sheets	**Permaclad**	Sheets of stainless steel that are inseparably welded to a mild steel backing.	Can be subjected to a much deeper draw without annealing than stainless steel. Can be arc-welded, spot-welded, or soldered with ease and safety.
Casting Sealant	**Permafil**	Liquid resin that is changed to a tough, clear solid, free from voids, by the action of catalysts and heat.	For salvaging porous castings. Applied by vacuum impregnation, followed by short oven bake.
Non-melting Lubricant	**Plastilube**	A lubricant which does not melt at temperatures up to 500 degrees F. and possesses high adhesive qualities, resistance to breakdown, and pumpability at low temperatures.	For automotive and industrial applications.
Casting Compound	**Plasti-Metl**	A copper-colored compound which is harder than some casting metals, yet may be poured into molds at room temperature. It sets without heat, forming a hard, tough, metallic-appearing casting that can be machined or polished with ordinary tools. Once the compound sets, it cannot be softened by heat and resists all common chemicals except strong alkalies.	Useful for casting forming molds and machine replacement parts by pouring the compound into rubber, plastic, metal, or clay molds with or without inserts.
Rust Preventive Compound	**Protect-O-Metal No. 8**	A coating which prevents adhesion of flash and weld spatter during welding operations. May be applied by brushing, spraying, or dipping. Dries to form a transparent coating which prevents rust up to six months on steel exposed to atmosphere, and up to two years on steel stored indoors.	For protection of parts and raw stock against rusting prior to welding and between metal-working operations.
Carbon Bearing Material	**Pure-bon No. 5**	A carbon-graphite material, composed of fine, bonded particles, which is resistant to wear and abrasion. It does not melt, seize, or change its shape when subjected to high temperatures and is unaffected by most acids and alkalies.	For molded bearings both large and small.
Metal Cleaner	**Quaker Formula 100**	Synthetic cleaner for the removal of mineral type soils. Provides fine grain but superficial etch on aluminum, which gives good paint adhesion.	For preparing metal surfaces for bonderizing, electroplating, and painting. Can be used to clean steel, brass, die-casting alloys, and aluminum.
Conveyor Belt	**Raynile**	High-tension fabric belt of woven rayon and nylon. In addition to high tensile strength, it has excellent transverse flexibility and minimum stretch in actual operation, and is easy to splice in the field.	For conveyor applications where belt tensions run as high as 1000 pounds per inch of width.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Core-binder Resin	**Resinox No. 4846**	A rapid-curing thermosetting phenolic of high bond strength and low cost. A wide range of core properties, including high tensile strength, high baked permeability, resistance to abrasion, and dimensional stability, may be obtained by varying the core composition.	For use in foundries where cleaner castings with better surface finish, greater detail, and less tendency toward veining, scabbing, and spalling are required.
Plastic Laminate	**RN-30**	Unwoven cotton-fiber laminated plastic with improved mechanical strength, machinability, and finish. Its strength is uniform in all directions.	For use in making gears, cams, pinions, bearings, and similar industrial products. Particularly suitable for fine-tooth gears.
Flexible Coating	**Rustarest No. 30**	A clear, transparent coating that dries quickly without baking. When used as a primer, it prevents paint from chipping off and expands and contracts with the metal regardless of temperature extremes.	Used as a protection for ferrous or non-ferrous metals against corrosion, and as a protection for the surfaces of parts during shipment or storage.
Primer	**Rust-O-Primer**	Combination chemical pre-treatment and primer for metal that provides a hard foundation for any type of paint.	Can be applied over wet or dry and clean or rusted metal, including steel, aluminum, and galvanized iron.
Aluminum Paint	**Rustrem Super Aluminum**	A heavy-duty aluminum anti-rust paint which may be applied directly over rust without wire-brushing or scraping. It penetrates and seals the surface, preventing further rust action.	For painting rusted surfaces to prevent further rust action.
High-temperature Lubricating Oil	**Safco No. 1250 Hi-Temp**	Carbon-free oil which does not spread and is effective at severe operating temperatures.	For bearings and chains used in conveyors and ovens operating at high temperatures.
Steel for Mold Cavities	**Samson Extra**	An alloy steel which provides excellent hobbing qualities, good machinability, and high core strength. The yield strength of this steel is about double that of a good grade hobbing iron.	For hobbing intricate mold shapes and for more accurate reproduction of hob design.
Glass Filament Packaging Tape	**Scotch Brand Filament Tape No. 890**	A glass filament, pressure-sensitive adhesive tape having a tensile strength of 500 pounds per inch of width.	For heavy-duty packaging, strapping fiber-board cartons, and similar jobs.
Tape Type Adhesive Film	**Scotch-Weld**	Unsupported film of pure adhesive that provides a metal-to-metal bond resistant to shear tests up to 3500 pounds per square inch.	Used under heat and pressure to bind metal to metal, fiber, wood, and plastic surfaces.
Casting Sealer	**Sealant P.E. No. 1**	Leaves no gummy residue, and surfaces, ducts, pockets, or machined areas show no visible sign of treatment. Pressure-tightness can be obtained with only one impregnation.	Intended primarily for impregnation of low-density metals, such as aluminum and magnesium alloys. Also can be used for bronze, steel, and gray iron castings.
Plastic Paint	**Series K**	A self-priming vinyl-base paint that adheres tightly to metal, wood, or concrete, and resists corrosion.	For applications requiring corrosion-resistance to most acids and alkalies, as well as grease, oil, and alcohol.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Thermal Barrier Materials	**Stabond FR-8** **Stabond FR-10**	Sealing compounds that are capable of withstanding temperatures as high as 2800 degrees F.	Can be applied by trowel, brush, or extrusion gun to electrical junction boxes, heat exchanger couplings, etc. Useful for steam-pipe lagging and hot-air ducts, and also as an abrasion-resistant coating for electrical systems.
Stainless Steel	**Stainless Steel 17-7 PH**	A precipitation-hardening stainless steel having a corrosion resistance approaching that of 18-8 stainless steel, high strength, and high hardness. In soft tempers, this alloy can be severely formed or drawn and welded by resistance, metallic-arc, and inert-gas shielded-arc methods.	Adaptable to the manufacture of springs and spring-wire products, and suitable for applications requiring stainless properties in addition to hardenability. It may be hardened by heating to the relatively low temperature of 900 degrees F. with subsequent air or furnace cooling.
Stainless-steel Powders	**Stainless-Steel Compacting Powders**	The strength of pressed compacts prior to sintering has been increased as compared with other stainless-steel powders, while the chemical analysis of the new powders corresponds to that of standard chromium and chromium-nickel steels.	For production of pressed and sintered stainless-steel parts having high mechanical strength and corrosion resistance.
Stainless Steel	**Stainless Steels, Low-Carbon**	Low-carbon stainless steels of 0.03 per cent maximum carbon, which have a resistance to intergranular corrosion equivalent to that of 18-8 columbium- or titanium-bearing steels.	For application requiring welded stainless-steel construction involving short heating times in the sensitizing temperature range.
Stainless-steel Tubing	**Stainless No. 10 Tube**	This steel work-hardens more slowly than conventional chromium-nickel steels. Chemical analysis: Carbon, 0.08 maximum; chromium, 16 per cent; nickel, 18 per cent.	For tubular parts requiring severe cold-forming, bending, spinning, coining, extruding, and upsetting, as well as parts to be soldered or brazed after cold-working.
Sub-zero Rubber Compound	**Stalwart**	Rubber compound with Butaprene base that withstands prolonged exposure to low temperatures without loss of flexibility.	Resists fats, dilute acids, alkalies, petroleum products, hydrocarbons, and solvents. Can be extruded, machined, punched, and molded.
Heavy-duty Grease	**Sta-Put 18H-2**	Aluminum-soda grease with an exceptionally high melting point. Will not separate in automatic or centralized lubrication systems.	Especially recommended for large heavily loaded presses, contracting, mining, and dredging equipment, hoists, cranes, etc.
Strippable Coatings	**Strippable Coating SP-14**	This coating has no effect on color or finish of any part to which it is applied, and, when dry, is non-inflammable, abrasive-resistant, and strongly adherent.	For coating enameled, lacquered, and plastic surfaces.
	Dip-Pak No. 532	A hot-melt coating which provides protection during processing, storage, and shipment of metal parts, such as tools, gears, and machine parts. It may be easily removed by slitting and peeling off.	For temporary protection of precision tools and machined parts.
Stripper	**Stripper S-17** **Stripper S-19**	Room-temperature strippers for synthetic enamels.	Particularly suitable for removing heavy coatings of enamels that accumulate on work-holders and hooks.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Hard-surfacing Powder	**Surfaceweld A**	Used for depositing a thin chromium-carbide type of hard surface that is highly resistant to abrasive wear and corrosion. When mixed with water, it forms a paste that adheres to flat or curved surfaces.	Applied by means of alternating-current arc with single carbon electrode, with twin carbon arc, or with direct-current carbon electrode negative. Particularly applicable to thin work or in cases where small alternating-current welders are used.
Surface Cleaner	**Surprep**	A liquid cleaner containing oil-displacing chemicals that dissolve rust, oxide, and scale. Application of this cleaner results in the deposit of a light phosphate film on the metal surface.	For cleaning surfaces prior to organic finishing as well as providing a base for the organic finish.
Concrete Repair Material	**Tampatch**	Repair material for use on concrete floors. Withstands heavy traffic loads and sets quickly.	Applicable to broken or rough interior or exterior concrete surfaces.
Rust Inhibitive Primer	**Totrust**	A rust penetrating paint primer which inhibits rust at its source to control further corrosion.	Used as a paint primer and finish coat for the protection of rusted areas of metal surfaces against further corrosion.
Leak Detector	**Trace**	A red compound which indicates the presence of either small or large leaks by depositing a red non-corrosive film at the point of leakage.	To detect leaks in hydraulic systems and closed liquid systems of all types.
Hammer-effect Enamel	**Tuf-On Hammer-Namel**	An abrasion-resistant hammer-tone finish.	For covering imperfections on metal surfaces.
Anti-corrosive Primer	**Tuf-on-Rust**	A primer that can be applied directly over corroded iron or steel surfaces by brushing or spraying.	For plant maintenance and steel structures.
Hammer Finish	**Un-i-loid**	A one-coat enamel which produces a lustrous, hammered effect when sprayed at standard enamel pressure. This enamel, available in a full range of colors, may be baked or air-dried.	To produce a hammered finish.
Free-machining Steel	**USS MX**	Provides longer tool life, greatly improved surface finish, and up to 20 per cent increase in machinability compared with standard Bessemer bar stock.	For use in automatic screw machine operations.
Lubricant	**Way Lubricant D**	Will not squeeze or press out either when machine is in motion or standing still. Will not corrode steel and copper and will not plug filters.	For use on all kinds of machine ways—hardened steel, chilled cast iron, or laminates.
Square-mesh Wire Cloth	**Wickwire Wire Cloths**	A line of wire fabrics which have high strength resulting from an electric welding process which joins lateral and transverse wires together.	For wire cloth applications requiring galvanized or plain steel finish.
Insulating Tape	**Wrap-Rax**	Orange-colored synthetic-resin tape that chemically resists all cleaning, pickling and plating solutions commonly used.	Is effective as a "stop-off" in hard chromium and other plating solutions, and prevents disintegration of plating racks.

Production Rates Increased with Fast Cutting Screw Steel

By HENRY J. HOLQUIST
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IN the highly competitive business of making screw machine products—where seconds or fractions of a second per piece cut from production time can spell the difference between profit and loss—it is practically a "must" for the job-shop operator to be alert to the time- and cost-saving possibilities offered by new materials.

For a long time, AISI B-1112 and B-1113 Bessemer sulphurized carbon steels have been accepted as the fastest cutting screw steels obtainable. They have been used for volume production of an almost infinite variety of screw machine products. Because of its higher machinability rating, B-1113 has largely supplanted B-1112 for a majority of products made on automatic screw machines.

Recently, however, fast cutting steels have become available which promise an even higher rate of production on screw machine parts. Among these exceptionally free-machining steels is the lead-bearing, open-hearth screw steel produced under the trade name "Ledloy" by the Inland Steel Co., and marketed by Joseph T. Ryerson & Son, Inc.

In comparison with B-1113 steel, this steel can be machined up to 50 per cent faster, with greatly increased tool life, and at the same time possesses the advantages of good ductility, high impact values, good transverse strength, and effective casehardening qualities. When carburized in a box at 1700 degrees F., the case hardness and depth of case approximate those of the open-hearth, high-manganese, high-sulphur steels. Carburized "Ledloy" compares favorably with these high-manganese, high-sulphur steels for light loads and wear resistance.

"Ledloy" is an open-hearth screw steel of approximately the same analysis as C-1113, with from 0.15 to 0.25 per cent lead added to enhance its machinability by lowering the friction component of the steel in machining. The lead has no appreciable effect upon the mechanical properties, and is so finely dispersed that it cannot be seen under a microscope. It is noted that the electrical properties of this steel, as expressed in permeability and retentivity, are at no variance with those of B-1112 or B-1113. Furthermore, the mechanical properties, from heat to heat, are more consistent than those of B-1113.

The following time and performance studies were made at the plant of the Milled Screw Products Co., Chicago, Ill. This company is a jobbing shop, operating eighty-three Brown & Sharpe automatic screw machines, other machine tools, and a complete hand screw machine department.

"Ledloy" screw steel is rated at from 300 to

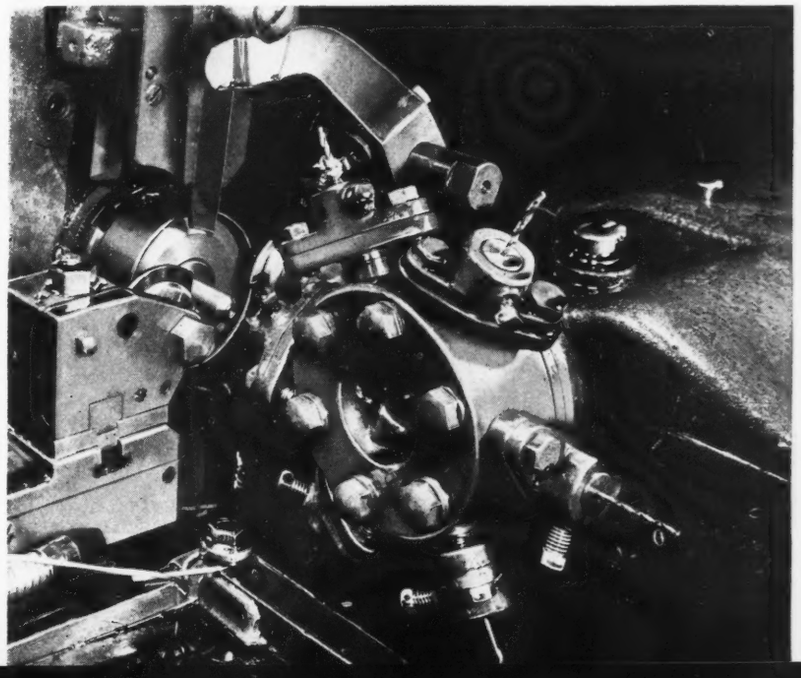


Fig. 1. Plungers 3/4 inch long are produced from 1/2-inch diameter lead-bearing steel bars at a cutting speed of 294 surface feet per minute, which represents an increase of 40 per cent over the speed that can be employed on conventional screw steel

325 surface feet per minute, in comparison to 225 surface feet per minute for B-1113 steel. Although the examples given here are typical, it should be kept in mind that much higher speeds can be employed in machining this lead-bearing steel—up to 450 feet per minute with high-speed steel tools and up to 600 feet per minute with carbide tools.

The first study covered the production of plungers made from 1/2-inch diameter stock. The plungers are approximately 3/4 inch long. Using a Brown & Sharpe No. 0 automatic, the sequence of operations performed on this part are: Center, drill, drill, ream, form, and cut off. The bore at the formed end is 1/8 inch in diameter, while the bore at the cut-off end is 1/16 inch in diameter.

The following is a comparison of the machining time and speeds obtained:

	B-1113	"Ledloy"
Cutting Speed, Surface Feet per Minute	210	294
Total Time per Piece, Seconds	25	18 1/3

This represents an increase in surface feet per minute of 40 per cent, and in production of 36.3 per cent when using "Ledloy." This increase does not take into account the greater production obtained per machine-hour due to longer tool life. About five times greater tool life was secured in machining the lead-bearing steel, there were fewer rejections, and a better finish was obtained. A close-up view of the machining operation is shown in Fig. 1.

The second study covered the production of an adjustment plug, approximately 7/8 inch long, made from 1/2-inch diameter stock. Using a Brown & Sharpe No. 2 automatic, the operations performed in sequence were: Threading (1/2 inch–20 per inch); cutting off; and slotting. With this job, the following comparison was made:

	B-1113	"Ledloy"
Cutting Speed, Surface Feet per Minute	220	276
Total Time per Piece, Seconds	17 1/2	14

Expressed in per cent, the use of "Ledloy" permitted an increase in surface feet per minute of 25.5 per cent, and an increase in production of 25 per cent. As in the previous case study, these figures do not take into account the increased production obtained per machine-hour due to longer tool life. On this job, chaser life was doubled, a better finish was secured, and the general quality of the product was improved. It was noted that the lead-bearing steel machined to a fine, satin-like surface finish. A close-up view of this machining operation with the cut-off tool in position is shown in Fig. 2.

No attempt was made in conducting these studies to determine accurately the cost per piece of the finished parts. Many variables enter into screw machine shop costs, such as labor, machine overhead, chip removal, oil salvage, etc. In general, however, it may be said that with the cost of "Ledloy" running about 13 per cent more than B-1113, the increased production per machine-hour more than offset the additional material costs, effecting a worthwhile saving.

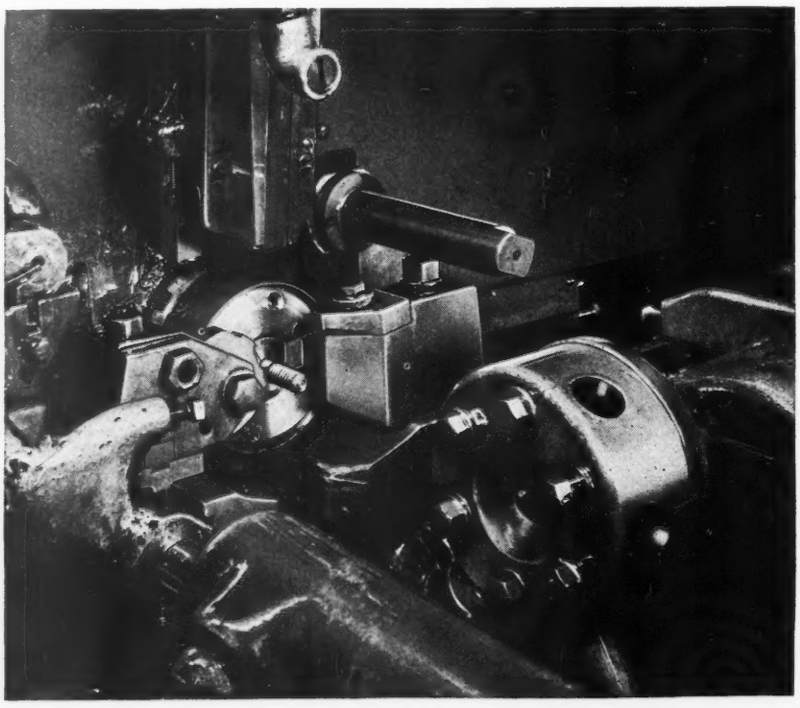


Fig. 2. Close-up view of the automatic screw machine set-up employed in producing 7/8-inch long adjustment plugs from 1/2-inch diameter bars. Production was increased 25 per cent by changing to a lead-bearing steel

Designing Disk Cams Without "Trial and Error" Lay-Outs

By SHERWOOD C. BLISS, Consulting Engineer

IN the design of disk cams, consideration must be given to the forces to be transmitted and the motion required. Assuming that force considerations have determined the roller and follower sizes, the next step is to satisfy the motion requirements. There are occasions when it is difficult to satisfy these requirements because of cam interference.

As an example, in Fig. 1, the follower cannot move along the required follower path from point A to B, since this would require the removal of the interfering cam contour between points A' and B'. Such a condition, which may be termed "cam interference," is usually eliminated by "trial and error" methods which (1) increase the diameter of the cam or (2) spread the cam throw over a greater angle. The method to be described provides a means of directly determining the dimensions of a disk cam that will avoid cam interference.

For the purpose of illustrating the method used, this discussion will be confined to disk cams with roller followers that move on lines which are radial to the centers of rotation of the cams. In order to keep the forces involved within reasonable limits, the acceleration of the roller follower during one-half of its movement and its deceleration during the remaining half will be assumed to be uniform.

Fig. 2 is a displacement diagram for a cam having the characteristics mentioned. The heavy line in the diagram represents the path of the center of the follower roller. For convenience, this path will be termed the "follower curve" to distinguish it from the curved contour of the cam. Let

T = time in seconds for follower to move S inches; and

a = acceleration or deceleration of follower in feet per second per second.

Then for uniform acceleration or deceleration,

$$a = \frac{S}{3T^2} \qquad (1)$$

The follower curve is formed by two parabolas having their origins at o and b and terminating at the mid point of the diagram. The equation for a parabola is:

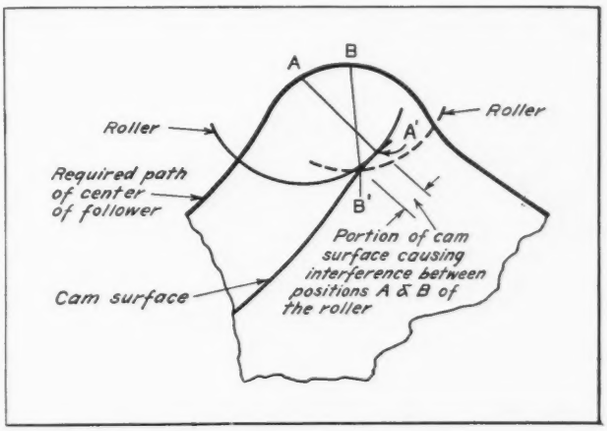


Fig. 1. Cam contour interference between points (A') and (B') prevents roller motion along the follower path from (A) to (B)

$$y = x^2C \qquad (2)$$

In the diagram, $y = \frac{S}{2}$ when $x = \frac{L}{2}$.

Therefore

$$y = 2S\left(\frac{x}{L}\right)^2 \qquad (3)$$

Differentiating (3) with respect to x, and letting d equal the slope of the curve,

$$d = \frac{dy}{dx} = \frac{4Sx}{L^2} \qquad (4)$$

At the mid point of the follower curve where $x = \frac{L}{2}$,

$$dm = \tan A = \frac{2S}{L} \qquad (5)$$

At the ends of the follower curve in the displacement diagram, the value of x is zero and the curvature of the curve is:

$$\frac{1}{r} = \frac{\frac{d^2y}{dx^2}}{\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}$$

Then since

$$\frac{dy}{dx} = 0 \text{ at } x = 0$$

and

$$\frac{d^2y}{dx^2} = \frac{4S}{L^2}$$

$$\frac{1}{r} = \frac{d^2y}{dx^2} = \frac{4S}{L^2} \qquad (6)$$

and

$$r = \frac{L^2}{4S} \qquad (7)$$

The radii r_o and r_b in the displacement diagram are equal. The circle having a radius F represents the diameter of the follower roller. The contour of the cam is represented by the light line. It should be noted that the curvatures of the cam contour at its high and low points depend upon the relationship between the radii r and F. Unless r is greater than F, cam curve interference will be encountered.

In designing a disk cam for the type of motion represented by the displacement diagram Fig. 2, it will be found that the diameter of the cam affects the value of the angle A and the curvatures of both the follower curve and the cam contour at their high and low points.

Figs. 3, 4, and 5 show disk cams designed for the type of motion shown in the displacement diagram Fig. 2.

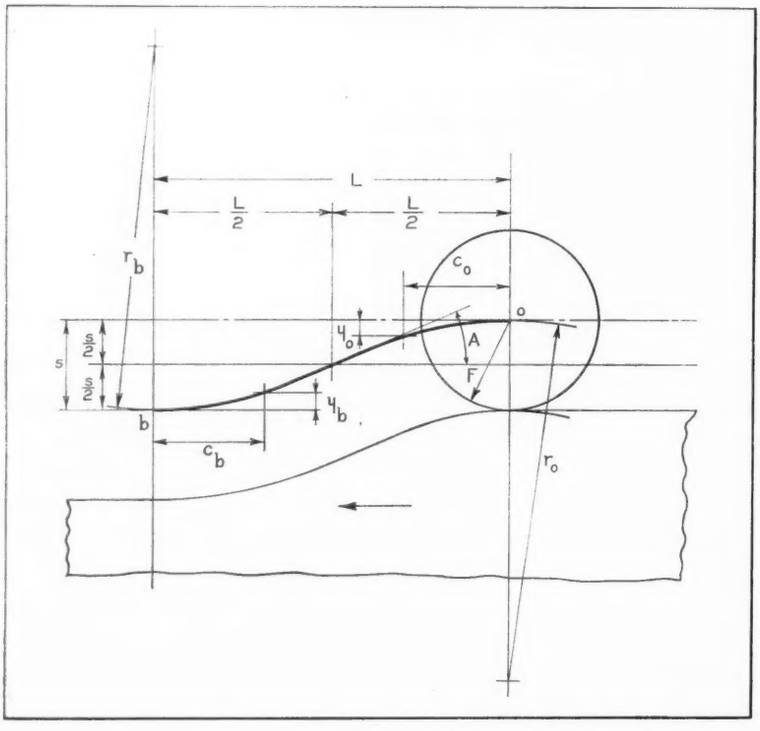


Fig. 2. Displacement diagram for a uniformly accelerated and decelerated roller follower motion

Let N equal the number of revolutions per minute of the cam and B the angle in degrees for the rise S in inches. Then the acceleration or deceleration may be found by using Equation (1) as follows:

$$a = \frac{S}{3T^2} = \frac{S}{3}\left[\frac{N \times 360}{B \times 60}\right]^2 = 12S\left(\frac{N}{B}\right)^2 \qquad (8)$$

In designing the cams shown in Figs. 3, 4, and 5, the following values will be assumed in order to illustrate some important factors affecting their operation and production: $S = 0.5$ inches; $B = 30$ degrees; and $N = 60$ R.P.M.

The acceleration or deceleration for all three cams using Equation (8) is 24 feet per second per second. It can be seen from an examination of Equation (8) that the acceleration depends entirely upon the values assumed for S, B, and N, and is independent of the diameter of the cam and the angle A at the mid point of the follower travel.

The curvature of the circle whose radius R_o is the distance from the center of the cam to the high point on its follower curve is $\frac{1}{R_o}$.

To find the curvature $\frac{1}{r_o}$ of the cam follower curve whose radius is r_o, we must add the curvature $\frac{1}{R_o}$ to the value of the curvature calculated from Formula (6) as follows:

$$\frac{1}{r_o} = \frac{4S}{L_o^2} + \frac{1}{R_o} \qquad (9)$$

where L_o is the arc length intercepted by the angle B at radius R_o. The value in radians of the angle B is $\frac{B}{57.296}$; therefore

$$L_o = \frac{R_o B}{57.296} \qquad (10)$$

Eliminating L_o by combining Equations (9) and (10),

$$r_o = \frac{(R_o B)^2}{(13131S + R_o B^2)} \qquad (11)$$

Rearranging Equation (11),

$$\frac{13131Sr_o}{B^2} = R_o^2 - R_o r_o \qquad (12)$$

Completing the square in Equation (12) and extracting the square root,

$$R_o = \sqrt{\frac{13131 S r_o}{B^2} + \left(\frac{r_o}{2}\right)^2} + \frac{r_o}{2} \quad (13)$$

The value of the radius r_b is based upon the length of the arc at radius R_b intercepted by the angle B. Thus,

$$r_b = \frac{(R_b B)^2}{(13131 S - R_b B^2)} \quad (14)$$

The values of the tangents of the angles A in Figs. 3, 4, and 5 are based upon the lengths of the arcs of the radii $R_o - \frac{S}{2}$ or $R_b + \frac{S}{2}$ intercepted by the angle B. Thus,

$$\text{Tan } A = \frac{114.59 S}{\left(R_o - \frac{S}{2}\right) B} \quad (15)$$

$$R_o = \frac{114.59 S}{B \tan A} + \frac{S}{2} \quad (16)$$

The cam shown in Fig. 3 has been designed for an angle A of 30 degrees at the mid point of the follower curve.

In all of the cams, the radius F of the follower roll has been assumed to be 1 inch. The diameter of the follower roller and its stud should be determined by the total of the forces acting upon the roller. It may be found advisable to modify the value of the angle B in order to obtain a satisfactory design.

The value of R_o for the cam shown in Fig. 3 is found to be 3.558 inches, and the outside radius of the cam 3.558 inches—1 inch, or 2.558 inches. It will be noted that the radius on the cam shown in Fig. 3 at its high point is rather small. In fact, had a larger diameter than 2 inches for the follower roll been selected, the designer would have encountered cam curve interference, and the required motion with its uniform acceleration and deceleration could not have been obtained.

The radius r_o in Fig. 3 is calculated from Formula (11) to be 1.166 inches. Consequently, the radius of curvature of this cam at its high point will be 1.166 inches—1 inch, or 0.166 inch.

Without going into the allowable contact pressures on curved surfaces, we can decide to increase the value of $r_o - F$ for the cam shown in Fig. 3, since a larger radius at its high point will obviously increase the durability of the cam.

Once the acceleration and deceleration of the follower have been determined and a tentative diameter of follower roller suitable for the total load to be imposed on it has been selected, it is advisable to make two calculations—one for a radius R_o based upon a selected angle A, and the other for a radius R_o that will result in the cam contour radius $r_o - F$ being large enough to appear satisfactory.

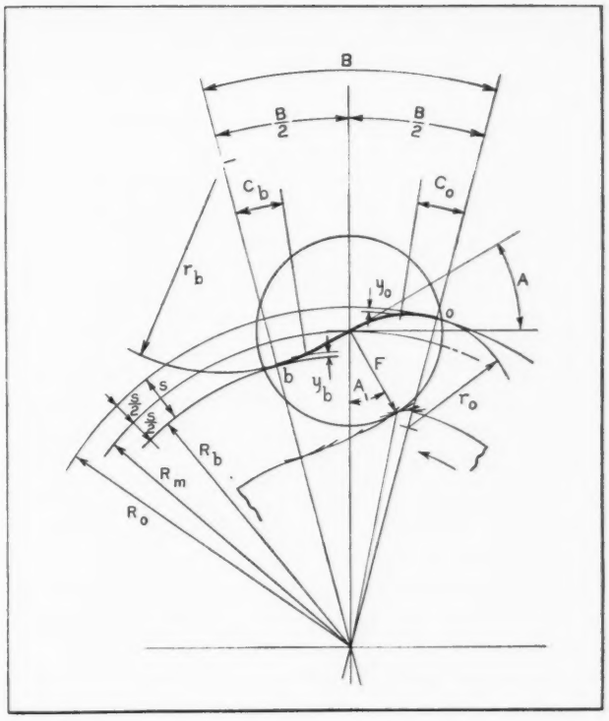


Fig. 3. Disk cam design based on the displacement diagram in Fig. 2

The cam shown in Fig. 4 has been designed for an assumed value of $r_o - F = 1/2$ inch, or

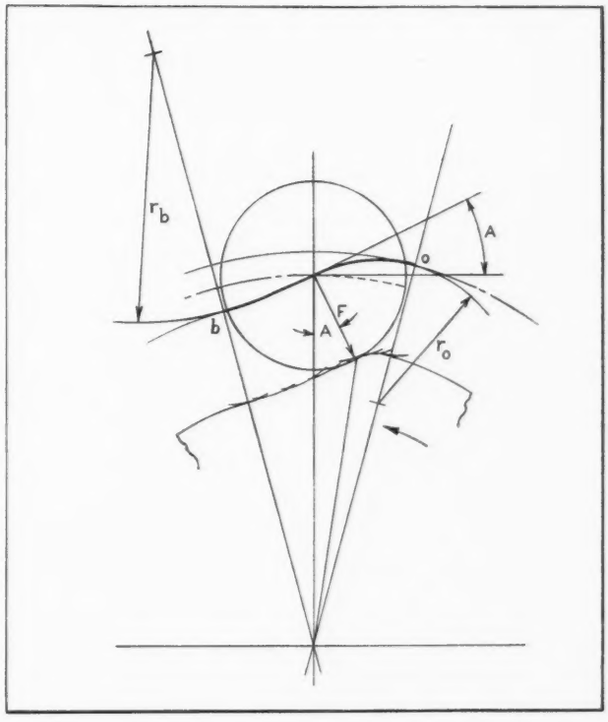


Fig. 4. Same design as Fig. 3 but with (R_o) increased to decrease pressure angle (A) and flatten cam contour curves

r_o = 1 1/2 inches. Using this value of r_o in Formula (13), we find R_o to be 4.142 inches, and the radius to the high point on the cam 3.142 inches which is 0.584 inch greater than for the cam shown in Fig. 3.

Examination of Figs. 3 and 4 shows the locations of the centers of the radii r_b to be such that those portions of the follower curves and cam contours which are formed by their arcs are re-entrant—that is, curved inward toward the cam center. In making accurate masters for cams having this characteristic—that is, re-entrant curves in their contour—it is necessary to calculate the path of the center of the follower roller in its radial relations to the center of the cam and its angular relations to some fixed radius on the cam. This path may be calculated from the values found for $R_o - y_o$ and $R_b + y_b$.

Let C equal the angle in degrees from the high or low points on the cam to some radius; then

$$y = 2S\left(\frac{C}{B}\right)^2 \qquad (17)$$

The slope d at any point on the follower curve can be calculated from the following:

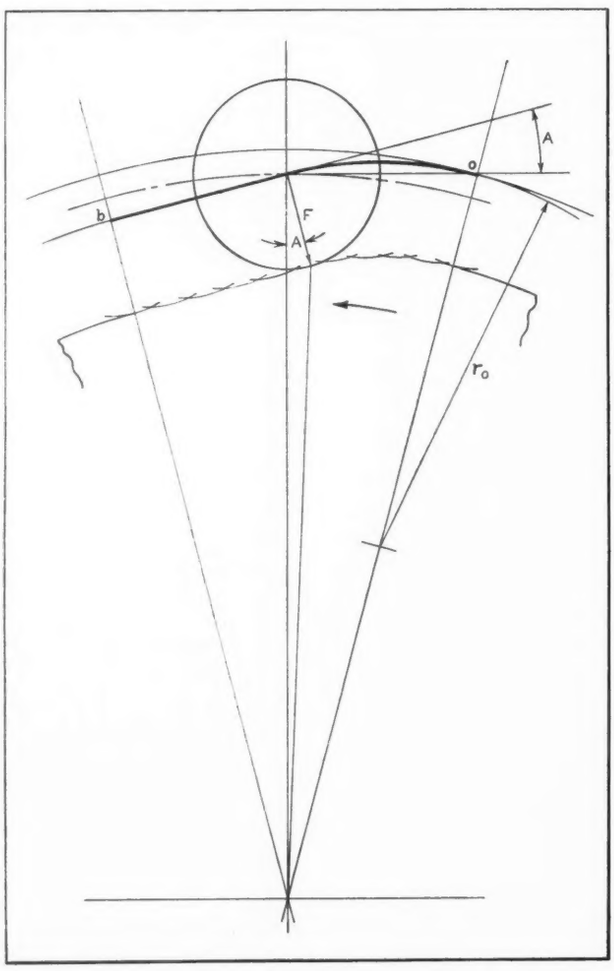


Fig. 5. Same design as in Fig. 3 but with radius (R_o) further increased to eliminate re-entrant cam contour

$$\text{Slope } d_o = \frac{229.18SC_o}{(R_oB^2 - 2SC_o^2)} \qquad (18)$$

$$\text{Slope } d_b = \frac{229.18SC_b}{(R_bB^2 + 2SC_b^2)} \qquad (19)$$

The actual contour of the cam can be calculated from the path of the follower, the slope d, the roller radius F, and the angles C.

After completing the calculations for the path of the roller follower for cams such as shown in Figs. 3 and 4, the masters are then jig bored or milled with a cutter having the same diameter as the follower roll. It may be advisable to use a tool that cuts a diameter which is slightly smaller than the diameter of the follower roll in order to avoid cutting below the desired master cam contour. This method of machining the master leaves a number of ridges on the contour which must be smoothed up by hand.

Reference to Formula (14) shows that when $R_bB^2 = 13131S$, the radius of curvature at point b will, theoretically, become infinite, while the follower curve from its low point to its mid point, as shown in Fig. 5, will be *convex* a few thousandths of an inch in its relation to a straight line through these two points. In other words, it will not be a re-entrant curve in its relation to the center of the cam.

Let $R_b = \dfrac{13131S}{B^2}$; then the value of R_b for the assumed conditions will be 7.295 inches. Therefore, the outside radius of the cam shown in Fig. 5 will be 7.295 + 1/2 — 1, or 6.795 inches.

Whenever the values of the rise S of a cam and the angle B are such that this last method does not lead to an unreasonably large diameter, it will be found that this method will facilitate the production of an accurate master.

The author designed a cam to operate at 1500 R.P.M., with a 1/8-inch lift and contour characteristics similar to the cam shown in Fig. 5. This cam was successfully employed in a hydraulic pump unit.

After the radii and angles or slopes of the cam contour have been calculated, the master is roughed out, and then mounted on an arbor held in an indexing fixture. The fixture is mounted on the table of a surface grinder or milling machine, depending upon the accuracy desired, and the tangents to the cam contour ground or milled to the calculated heights above the center of the cam master as it is indexed to various positions. This method produces a number of flats on the master which are easier to blend than the ridges left by the jig boring or milling method previously mentioned. It has the advantage that the diameter of the grinding wheel or the milling

cutter does not affect the accuracy of the contour of the cam.

In conclusion, although the formulas given apply to designs where the cam follower moves on a radial line, they will also apply with reasonable accuracy to followers that move on circular arcs. In any case, their use will give the designer an idea of the size of cam required to avoid cam interference before he starts his lay-out instead of afterward, when an increase in cam diameter might require the revision of a number of details.

* * *

New Pattern Tool for Sheet-Metal Transition Pieces

A wartime job of building oddly contoured alcohol and water tanks to fit available spaces within submarines led to the invention of a pattern tool for sheet-metal transition pieces that is rapidly becoming the most important product of Ralph C. Hickernell's contract metal shop in Meadville, Pa. The idea was developed from the "target" method of patternmaking used at the Cramp Shipbuilding Corporation during the war.

Because of the necessity of utilizing all the available space on a submarine, tanks are tucked away in strange places. The calculations and drawings involved in making these oddly contoured tanks frequently require days of concentrated work. With the "target" method, however, a "mock-up" of the tank is built at the spot it is to occupy. Removed, the pattern for the tank can quickly and accurately be determined by rolling the "target" over the pattern paper and marking all outline points at which it touches.

Back in his own sheet-metal shop after the war, Hickernell considered the possibility of eliminating drawing-board drudgery and slide-rule mathematics on transition pieces such as shown in the illustration through some development of the target method. Obviously, a full-scale "mock-up" would be too time consuming and expensive. He solved the problem by devising the "Uni-Layout" pattern tool shown. This consists of two heads, into which half-shapes of the top and bottom openings of the tank can be clamped. These heads are then positioned for perpendicular height and angular adjustment over a simple vertical section drawing of the desired piece. The angular adjustment takes care of the desired taper. With the half-shapes and heads properly positioned, the tool is rolled over a sheet of pattern paper, and the paper marked where the heads touch it. This set-up makes a pattern for one-half the piece.

The "Uni-Layout" produces patterns for transition pieces of a variety of shapes with contours changing from square to round, rectangular to round, etc. It is said that patterns for such transition pieces can be produced in fifteen to twenty minutes with this new tool. Half-shapes for the heads are not furnished because of the almost infinite number that would be needed.

* * *

Steel companies buy approximately $10,000 worth of platinum and thousands of dollars worth of diamonds a year for industrial uses.

Tool that produces patterns for sheet-metal transition pieces of a variety of shapes, eliminating the time required for making calculations and drawings

Electrical Metallic Tubing

Fig. 1. Yoder roll forming machine and electric resistance welding machine recently installed in the Spang-Chalfant plant of the National Supply Co. for producing 30,000 feet of electrical metallic tubing per day

ELECTRICAL metallic tubing is a light-weight steel tubing used in the electrical industry as a carrier for wiring and cable. The tubing is electro-galvanized on the outside and has an interior finished with clear enamel. A new mill for rolling this tubing from strip steel and then welding it by the electrical resistance method has recently been installed in the Spang-Chalfant plant of the National Supply Co. at Etna, Pa. Tubing is produced by this mill in diameters ranging from 1/2 inch to 2 inches. Although the mill is only about 65 feet in length, from the box that holds the coiled strip to the rotary cut-off machine, it is capable of producing more than 30,000 feet of tubing per day.

The flat strip steel is fed from a coil into the Yoder tube-forming machine seen in the right background in Fig. 1. Each pair of rolls on this

Fig. 2. Close-up view of the welding unit on the electric resistance welding machine employed for the high-speed production of electrical metallic tubing

Rolled and Resistance-Welded

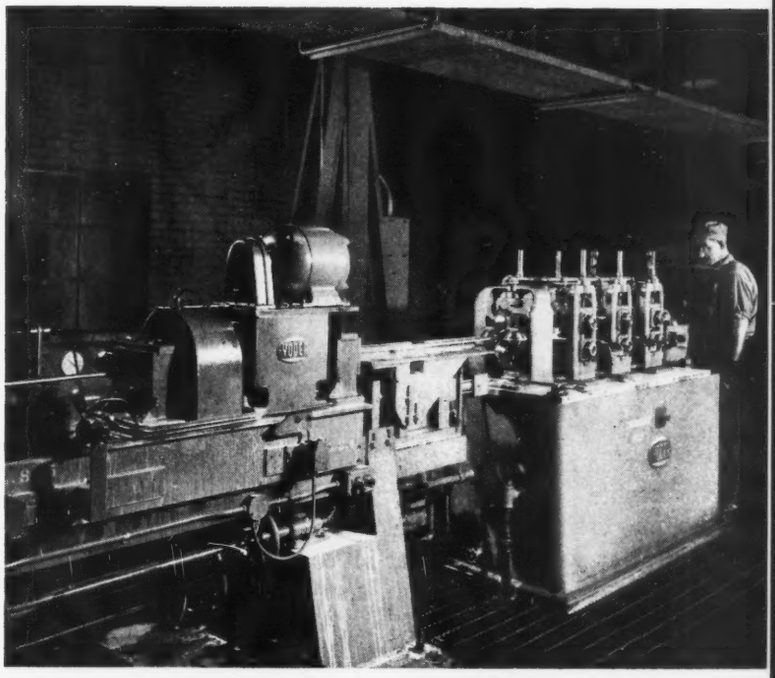


Fig. 3. The electrical metallic tubing is sized to the required diameter and simultaneously straightened by the unit at the right. The tubing is cut into 10-foot lengths by the cut-off tool on the machine at the left

machine is so shaped that the flat strip is successively formed into a curved strip, a U-shape, and finally a tube. As the tube leaves the forming machine, it enters the Yoder electric resistance welder seen at the left in Fig. 1, a close-up view of the welding unit being shown in Fig. 2. After the tubing has passed between the electrodes and the seam is completely welded, it goes through a series of water curtains for cooling.

As initially formed, the tube is slightly over size. When it comes from the cooling system it enters the sizing and straightening unit illustrated at the right in Fig. 3. After the tubing has been sized and straightened, it passes through the rotary cut-off machine seen at the left in Fig. 3, which cuts the tube into 10-foot lengths. The cut-off pieces are then conveyed to the Landis reaming and chamfering machine (Fig. 4).

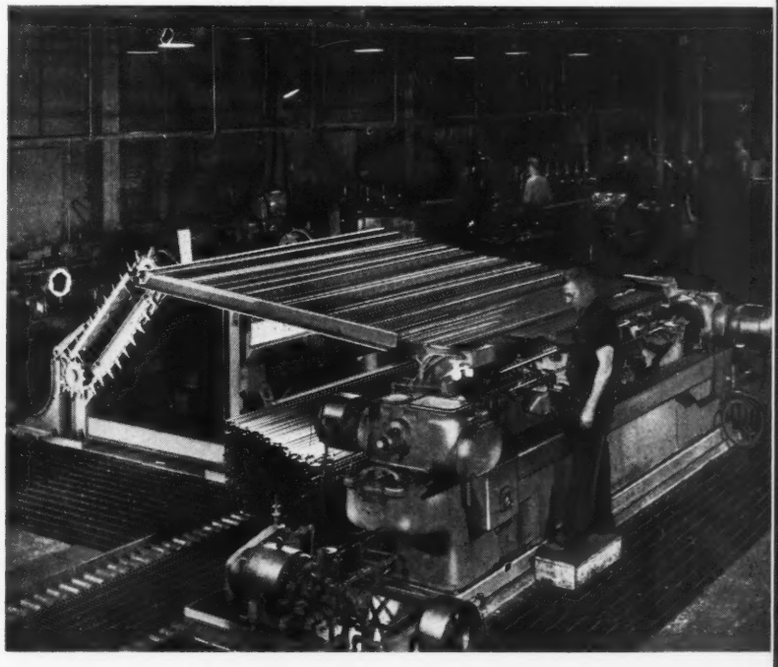


Fig. 4. Landis reaming and chamfering machine which finishes both ends of the tubing, brought from the tube mill by a chain-driven gravity conveyor

Magnesium-

Special Points to be Observed in Designing Fixtures for Use in Welding Magnesium Parts

By GILBERT C. CLOSE

WHEN the Northrop XB-35 "Flying Wing" took to the air on its maiden flight, this huge, tailless airplane represented more than a radical departure in aircraft design. It was without doubt the most complex magnesium structure ever built. Magnesium alloys were used under all conditions of stress—tension, shear, torsion, compression, and vibrational loads. Sheet stock, extrusions, and castings were distributed profusely throughout the giant frame. Fabrication methods included cold- and hot-forming, sand, permanent-mold, and centrifugal casting, stretch-forming, press-forming, and more than anything else, welding.

Northrop Aircraft, Inc., Hawthorne, Calif., has conducted extensive research into all phases of welding magnesium parts under the supervision of T. E. Piper, chief process engineer. The company was one of the first to adapt Heliarc fusion welding on a production basis, and one of the first to design and build highly stressed primary welded magnesium structures.

It was discovered early in the program that successful magnesium welding depends as much on proper design of the welding fixtures as on a thorough knowledge of the metallurgical principles involved. In general, these fixtures do not differ considerably from those for other types of fusion welding, yet there are many minor variations required due to the peculiar characteristics of the magnesium alloys. Failure to allow for these in designing the fixture may mean the difference between consistently successful welds and welds that are not dependable.

General Requirements for the Design of Welding Fixtures

In designing fixtures for successful magnesium welding, there are six requirements that must be met without exception. Some of these are the same as for general welding; others apply specifically to magnesium assemblies. The points to be observed are as follows:

1. Provide a rigid support for the structure to be welded.
2. Allow for expansion and contraction of the magnesium during welding.
3. Permit strain-relieving with the welded structure still in the fixture.
4. Provide accessibility for setting up and welding.
5. Include adequate clamping devices for holding the parts to the fixture.
6. Provide facilities for drilling critical holes after strain relieving and while the assembly is still in the fixture.

These requirements will be discussed in detail in the following paragraphs, and the methods employed at the Northrop plant for meeting them will be described.

The framework or supporting structure of the fixture must be rigid and strong enough to support the remainder of the fixture parts firmly in alignment and within the tolerances prescribed for the part to be welded. At the same time, the framework should not be bulky, nor should it interfere with the welder's movements.

In nearly all cases, the fixture should include mountings for trunnions, either hand- or power-driven. The worm-gear trunnion has been found most practical from the standpoint of ease of operation and safety. Aside from supporting its own structure, the fixture must be strong enough to withstand welding strains, and it must maintain accurate part dimensions. The physical structure of the fixture should be such that its mass can be used to advantage in cooling the welded part, thus minimizing warpage and distortion.

In regard to expansion and shrinkage, both factors require consideration in designing a welding fixture, though neither can be controlled by the fixture itself. This lack of control must be offset by adjustments that will allow unrestricted movement of the metal during welding,

Welding Fixtures for the "Flying Wing"

both in direction and amount. These adjustments must be flexible, as there is no fixed constant for predetermining the amount of movement. Shrinkage and expansion of magnesium during welding depend on several factors, including the size and design of the assembly, the metallurgical condition of the metal, residual strains from previous forming, and the personal technique of the welder. Methods of providing for shrinkage and expansion will be discussed later.

In every possible instance, the design of the fixture should be such that the welded part or assembly can be left in the fixture for annealing after welding. This will insure correct contours and the proper relationship of surfaces when the part is subsequently removed from the tool. Removing the part from the fixture prior to annealing may result in severe distortion from residual welding stresses as the metal approaches annealing temperature and before the residual stresses are relieved. On large assemblies, where the welded part, together with the fixture, cannot be placed in an annealing furnace, torch relieving and hand-working prior to removing the assembly from the welding fixture can be employed to advantage.

The fixture should be so constructed that all parts to be welded are completely accessible. The human factors of comfort and convenience should also be recognized. Blind welding is impossible, and poor welds are likely to result from cramped working positions.

Adequate clamping devices for holding the work during welding must be provided. These should be located so that they will not interfere with the welder's movements, and they should be quick acting and positive. Several clamps will be discussed later, but this detail offers the designer a real opportunity to exercise ingenuity and resourcefulness. Many different clamp designs can be devised on the spur of the moment to serve efficiently in conjunction with a specific part.

The fixtures shown in Fig. 1 are made from the dies in which the parts—airplane doors, in this case—were originally stamped. It can be seen that a good arrangement of clamps has been employed here.

In many instances, it will be advantageous to incorporate drill jigs in the welding fixtures for drilling critical holes. This is especially true when it would be expensive and difficult to produce another jig for holding the part during drilling. The best practice is to drill all critical holes in welded magnesium after strain relieving and before the part is removed from the fixture.

Consideration of Shrinkage and Expansion

Extra material, or "trim," must be added to the required amount of the sheet or extrusion being welded. This extra material is used to compensate for the shrinkage caused by welding, and the amount of "trim" required for a particular part can be accurately predetermined after several assemblies have been built and the

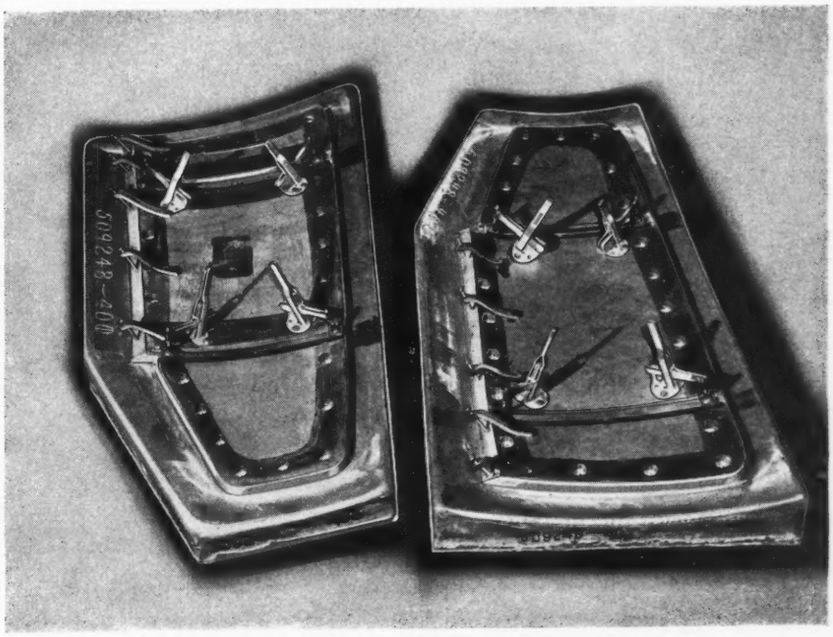


Fig. 1. Economical welding fixtures constructed from forming dies in which the parts were made. Quick acting clamps for proper pressure are arranged to provide maximum welding accessibility

amount of shrinkage has been determined. Of course, this extra size of the part or assembly must be allowed for in the fixture. Fig. 2 illustrates a fixture in which this allowance is made. The skin sheet to be welded is trimmed outside the scribed lines under the clamps in this fixture, after which it is located in the fixture for welding the ribs and stiffeners. This fixture was produced from a drop-hammer die used in forming the part to be welded.

In all cases, the shrinkage should be confined to the last weld to avoid accumulation of error. Error can be further minimized by working the welding strains out of each weld before proceeding to the next bead. This will aid also in preventing an accumulation of welding strains and residual stresses.

When the design of a fixture makes it necessary to force the work components into position prior to welding, the resulting strains cannot be subsequently relieved. This may have adverse effects when the structure is tested or is under actual load. What might have been an adequately designed structure may show up unfavorably under test. A fixture that permits free fitting of the work will effectively eliminate this factor.

If it is necessary to hold one edge to a specific dimension, the other edge must be free to move. Two edges may be held or stopped, but it must be done in such a manner that the movement of either edge is not limited in one direction, that is, the confined edges must not be opposite or parallel.

Also, some allowance should be made for expansion when clamping directly against the welded part in the direction of the expansion. Spring-loaded clamps or jacks may be devised to suit a particular job. Preheating of the work prior to clamping can also be done, and this is often the best method of making provision for the expansion.

Determining the Type of Fixture

Care must be exercised in designing fixtures where the work is held from the inside and such parts as cover sheets or extrusions completely enclose the fixture on the outside. In some cases, the welded assembly may shrink tight and become impossible to remove from the holding means unless the fixture can be relieved or collapsed from the inside. For this reason, a female fixture—or one that holds the work from the outside—is sometimes preferred, provided the design requirements can be met, although the amount of over-size allowance for shrinkage is more difficult to determine with fixtures of this type.

Female fixtures are desirable for partial or full monocoque sections (made up of sheets supported by ribs, but without longitudinal sections other than the shell itself). These should be constructed in such a manner that the part can be welded with an inside seam. The reason for this is obvious. When sheet stock is welded, it has a tendency to curve toward the top of the weld bead because the larger amount of molten metal at the top of the bead results in greater contraction on cooling. In a circular monocoque section, there is natural resistance to this inward curvature, and any deformation that does occur is easier to straighten than with a flat in which reverse curvature is induced by an outside weld bead. Also, in using a female fixture on this type of work, the interior is clear for locating frames, stiffeners, ribs, etc., without removing the part.

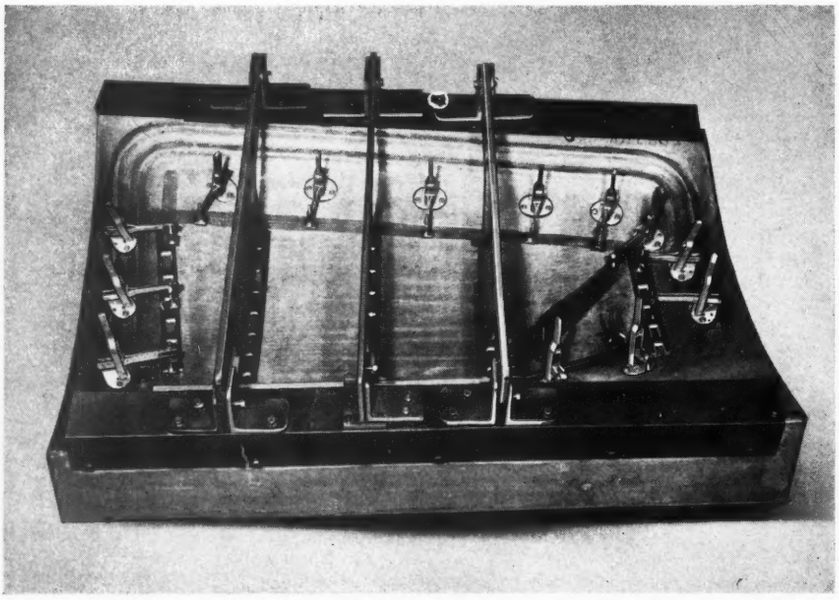


Fig. 2. Drop-hammer die converted into a welding fixture. The skin sheet to be welded is trimmed to fit outside the scribed lines, after which it is located in the die for welding the ribs and stiffeners

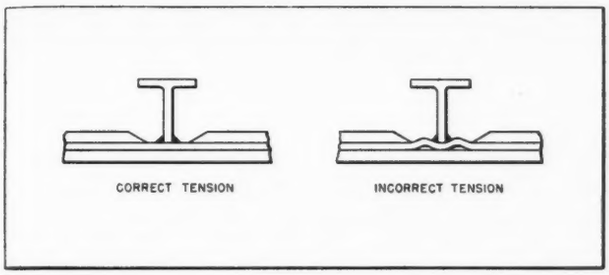


Fig. 3. Results of correct and incorrect hold-down pressure in welding extrusions to sheet stock. Hold-down plates must provide sufficient pressure on sheet magnesium without interfering with movement of the metal due to expansion and contraction

Clamping devices for the cover sheets are also more easily installed on a female fixture. In using a male fixture, wrap-around arrangements are about all that can be used.

Hold-Down Plates or Strips Required along Weld Seams

Hold-down strips or plates should be used along all weld seams in welding magnesium sheet stock. These strips provide a twofold service—first, they hold the material in place, and second, they conduct heat away from the magnesium part at a much more rapid rate than it would be possible for it to radiate into the air.

The hold-down strips should be as wide as practical. When too narrow, they require more clamps, and are not sufficiently rigid to resist buckling of the material. Strips 4 inches wide have been found to give good results on material up to 0.093 inch thick.

The hold-down strips should be about 1/4 inch thick, or as thick as forming permits. The edge adjacent to the weld bead should be beveled to an angle of 30 degrees to increase accessibility to the weld seam. If the edges of the strip are not beveled, and if they are mounted too close to the weld seam, the welding arc may "jump" to the strip. Moreover, if they are too close to the weld seam, the cooling effect becomes too pronounced and results in a weld bead that is rough and porous. The distance of the strips from the weld seam varies with the thickness of the material, and will have to be approximated for each job until the right distance is determined. Fig. 4 gives recommended settings of hold-down plates for various thicknesses of material and for butt and tee welds.

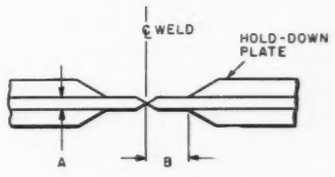
The hold-down strips should not be clamped so tightly that they will interfere with movement of the metal due to expansion and contraction. If they are too tight, the metal will buckle between the seam and the hold-down strip when heat is applied. This will cause the metal to pull away from the fixture and burn through under the arc. The strip should be just tight enough to hold the material against the fixture. Even though no noticeable buckling occurs, a hold-down strip that is too tight will result in many microscopic cracks along the weld.

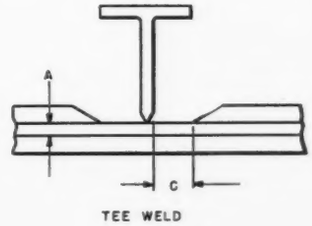
The same pressure considerations apply to holding extrusions or parts that require tee-welds. Only sufficient pressure to hold the extrusion to the magnesium sheet should be used. If too great a pressure is employed, the leg of the tee, or extrusion, will be forced into the magnesium sheet when the sheet is softened by the welding heat. This will result in subsequent buckling and distortion that is very hard to eliminate.

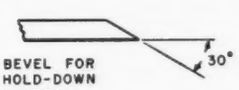
The pressure on the hold-down strips in welding extrusions to sheet stock should be the same

HOLD-DOWN PLATE SETTING – INCHES

A MATERIAL THICKNESS	B BUTT WELD	C TEE WELD
0.040	0.200	0.200
0.060	0.250	0.250
0.080	0.300	0.300
0.100	0.400	0.500
0.125	0.400	0.500
0.150	0.500	0.600
0.175	0.500	0.600
0.200	0.500	0.600
0.250	0.500	0.600
0.275	0.500	0.600
0.300	0.600	0.700







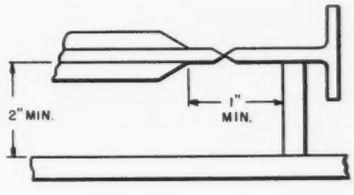


Fig. 4. Hold-down plates should be carefully located relative to the weld in accordance with settings recommended for various thicknesses of material and types of weld

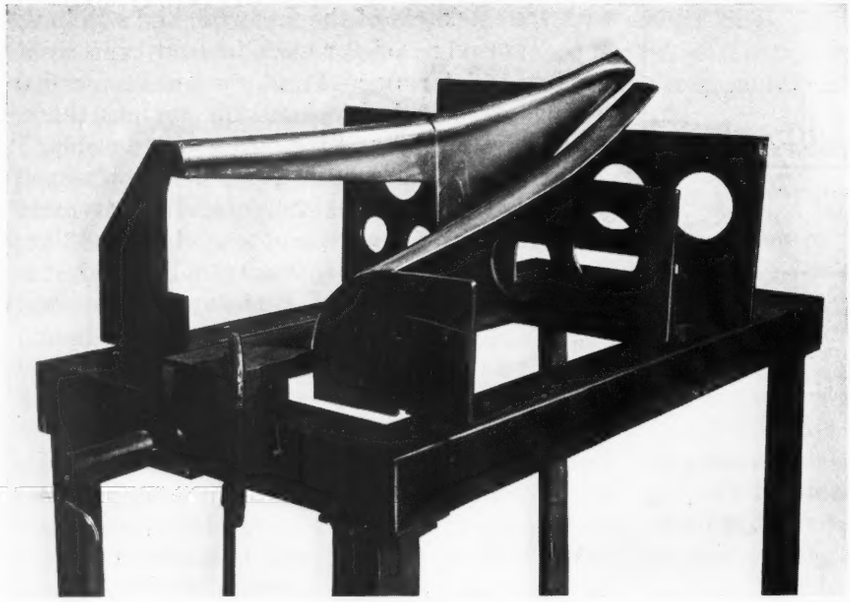


Fig. 5. Contoured sheets are fastened to "formers" by screws instead of tack-welding to prevent distortion. The "formers" are made and located on the fixture base by the use of templets

as in seam-welding the sheet stock only. In this connection, too much emphasis cannot be placed on the importance of proper preparation of the parts to be welded. Fitting, contouring, and tack-welding must receive major consideration. Fig. 3 illustrates the results of correct and incorrect hold-down pressure.

Use of Templets in Constructing Welding Fixtures

The use of templets in the construction of welding fixtures is recommended by Northrop tooling engineers. The necessity of employing contoured plate for welding cover sheets and monocoque sections where contours and tapers predominate make the use of templets essential. Fig. 5 illustrates a typical fixture in which the "formers" to which the contoured plates are fastened were made to templets and located on the fixture base by the use of the templets. Oversize dimensions required to compensate for shrinkage may be incorporated in the templet, with adjustments for changes in metal movement after welding noted on it, after the first assembly has been welded and checked.

Another application of templets is in welding small parts or sub-assemblies, where they can be used for scribing the desired contour on a suitable base, after which clips, stops, etc., can be mounted according to lines on the lay-out for clamping the parts in the correct position for welding. Such an arrangement is illustrated in Fig. 6. This type of construction is possible only where the effects of shrinkage are negligible and where there is no need for hold-down plates.

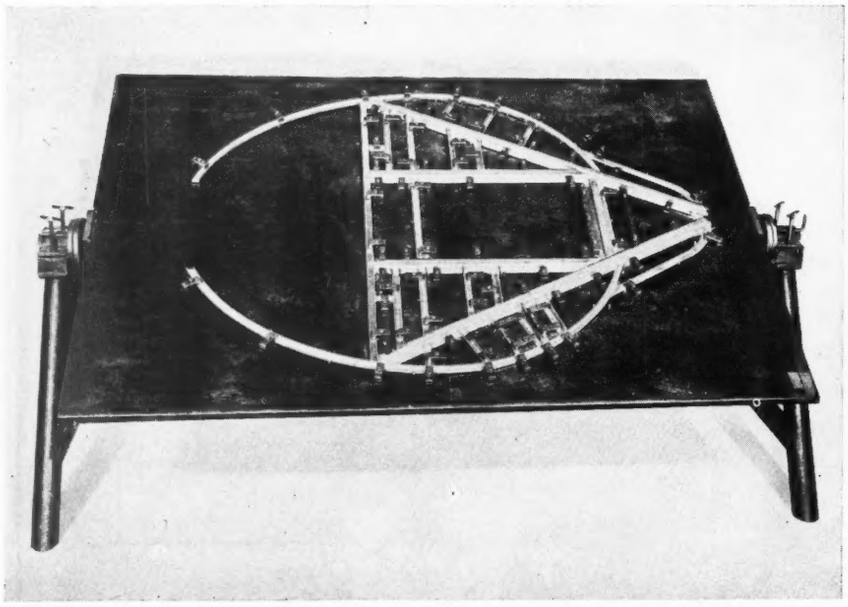


Fig. 6. By scribing the desired contour of the assembly to be welded on the fixture base by the use of templets, the clips and stops can be located so as to hold the work in the required position for welding

Drilling Holes in Welded Work

Attachment holes, clearance holes, or, in fact, any openings other than lightening holes, should not be drilled in the magnesium assembly until all welding has been completed and the part has been stress-relieved. The expansion and contraction during welding, combined with such hand-forming as may be necessary, will cause the metal to flow or creep so that the holes would shift in the direction of the greatest movement. Therefore, all critically located holes must be left until the last operation.

The location of sheets and webs in the welding fixture by means of drilled holes is impractical for the same reason. In extreme cases, where clamps cannot be used, holes may be drilled through the sheets for bolting the parts to the jig. Under these conditions, however, clearance must be allowed around the bolts for movement of the material, and the same pressure considerations observed as for hold-down strips.

Drill jigs on welding fixtures may be designed to be removable, thus increasing accessibility for welding. This is not considered good practice, however, for aligned holes that must be reamed. In these cases, drill jigs should be a permanent part of the fixture. Holes that are matched to fit some other assembly should have their drill jig permanently attached to the fixture also, but if the complete pattern of holes can be incorporated in one drill jig, no trouble should arise from using a detachable jig, provided it is accurately located on the fixture.

Summarizing, it should be stated that the design of fixtures for magnesium welding is a project with many variable factors. Dimensional requirements, size, and complexity of welded magnesium assemblies, methods of welding, alloys involved, and the number of similar parts that must be produced all have a bearing on the tool engineer's job. But once the requirements have been established, the tool engineer is entirely free to employ his own ingenuity in building around these basic prerequisites. This ingenuity can be safely exercised only after the engineer has a thorough knowledge of the factors relevant to production of the part, its relation to other parts in the finished product, and cost limitations of the fixture he is about to design.

Joint Machine Tool Industry Mobilization Reserve Group to Meet in Canada

REPRESENTATIVES of all branches of the machine tool industry will meet at the Royal York Hotel in Toronto, Canada, on October 10, for the purpose of reviewing mobilization plans of the machine tool industry in the light of developments in Korea and elsewhere. Herbert L. Tigges, vice-president of Baker Brothers, Toledo, Ohio, and president of the American Society of Tool Engineers, is chairman of the group.

The Joint Machine Tool Industry Mobilization Reserve Group was originally an outgrowth of preparedness activities of the Manufacturing Production Division of the National Security Resources Board, a United States Government agency. It has been meeting independently as an industry mobilization group to insure maximum preparedness of the machine tool industry at all times.

Speakers at the meeting will include Mr. Tigges; General Reimel of the National Security Resources Board; David Ayr, president of the National Machine Tool Builders' Association; and a representative of the Canadian machine tool industry. Group members who will give short talks include: E. C. Adams, Lincoln Lubricating Systems, Inc., New York City, whose subject is "Production Control—E-1-B"; Edgar J. Seifreat, president of Seifreat-Elstad Machinery Co., Dayton, Ohio, and a member of the A.S.T.E. Professional Engineers Committee, who will speak on the subject of "Diversions"; Victor Gottsman of Victor Gottsman Machinery Co., Detroit, Mich., who will discuss putting idle machines to work in the event of an emergency; and C. E. Needy of Landis Tool Co., Waynesboro, Pa., who will talk about present schedules of production ("Phantom Pool" orders).

Presidents or their representatives of the following industrial and trade groups active in the machine tool industry will attend: National Machine Tool Builders' Association, National Machine Tool Distributors Association, Machinery Dealers National Association, and National Tool and Die Manufacturers Association.

* * *

Nearly half of all the jobs provided by America's manufacturing industries depend upon the manufacture and use of steel.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Hydraulic Motors and Their Applications

G. D.—What are hydraulic motors and where are they generally applied?

A.—A hydraulic motor is any mechanism that converts hydraulic energy into mechanical energy. In this respect, it is the reverse of a hydraulic pump. It may be reciprocating, rotary, or centrifugal, since oil under pressure exerts a force against gears, vanes, plungers, pistons, or impellers, according to the form of the motor, to obtain mechanical energy.

Reciprocating hydraulic motors, consisting of pistons and cylinders of the non-rotating type, are used to produce reciprocating motions in machines or controls. This type of motor is also widely employed for multiplying force in such applications as hydraulic presses, cranes, etc. Gear or rotary piston types are most commonly used, being employed extensively to control sensitive mechanisms that require flexibility and precision of response.

Hydraulic motors of any type may be connected with the actuating pump either directly or through long oil transmission lines, the latter being a distinct advantage when mechanisms near explosives are to be operated or in other cases where remote control is desirable.

Commissions to Former Salesmen

C. W. F.—One of our former salesmen is suing us for commissions on merchandise we sold to customers that he regularly solicited. We had a written contract with the salesman which stated that we would not pay commissions on merchandise sold by us six months after he left our employ. The salesman claims that this does not exclude him from commissions on merchandise delivered to his past customers after this six months period. What is the law?

Answered by Leo T. Parker, Attorney at Law
Cincinnati, Ohio

You need not pay commissions to the salesman. Irrespective of undeserved and unfortunate financial losses, both employers and salesmen are bound by the exact terms of their contracts. In other words, the rights of the parties to a contract must be determined by the terms of the agreement they have voluntarily made, and a court will not make a different contract or relieve a contracting party of the consequences of a bad bargain.

For instance, in Tahir Erk vs. Glenn L. Martin Company [143 Fed. Rep. (2d) 232] it was shown that a manufacturer and a salesman signed a written contract. By the terms of this contract, the salesman was to receive 5 per cent commission on all business or sales. However, the contract contained a clause that the agreement could be cancelled by either party upon sixty-day notice in writing. The clause further stated that in the event the company should elect to cancel the agreement, commissions would be paid to the salesman for any business which he had instigated prior to the date of cancellation, provided such business was completed by the company within six months after date of the cancellation.

The company cancelled the contract, and eight months later the company sold many thousand dollars worth of merchandise to purchasers whom the salesman had solicited on numerous occasions before his contract was cancelled. The salesman sued the company for his commission, alleging that he had expended time and effort to sell the merchandise and therefore deserved payment. However, since the merchandise was sold more than six months after the company had cancelled the salesman's contract, the higher court refused to allow the salesman any payment.

* * *

General Electric Research Laboratory Celebrates Fiftieth Anniversary

The nation's first industrial research laboratory—the General Electric Research Laboratory—will celebrate its fiftieth anniversary during the week of October 9 with the formal dedication of its new home near Schenectady. Coincident with the celebration, the National Academy of Sciences will hold its autumn meeting at the laboratory from October 9 through October 12. This is the first time in the Society's history that its sessions have been held at an industrial laboratory. The laboratory plant consists of five buildings with a total area of 185,000 square feet.

Tool Engineering Ideas

Tools and Fixtures of Unusual Design, and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

Connecting Ends of Coiled Flat Wire with Stapling Attachment

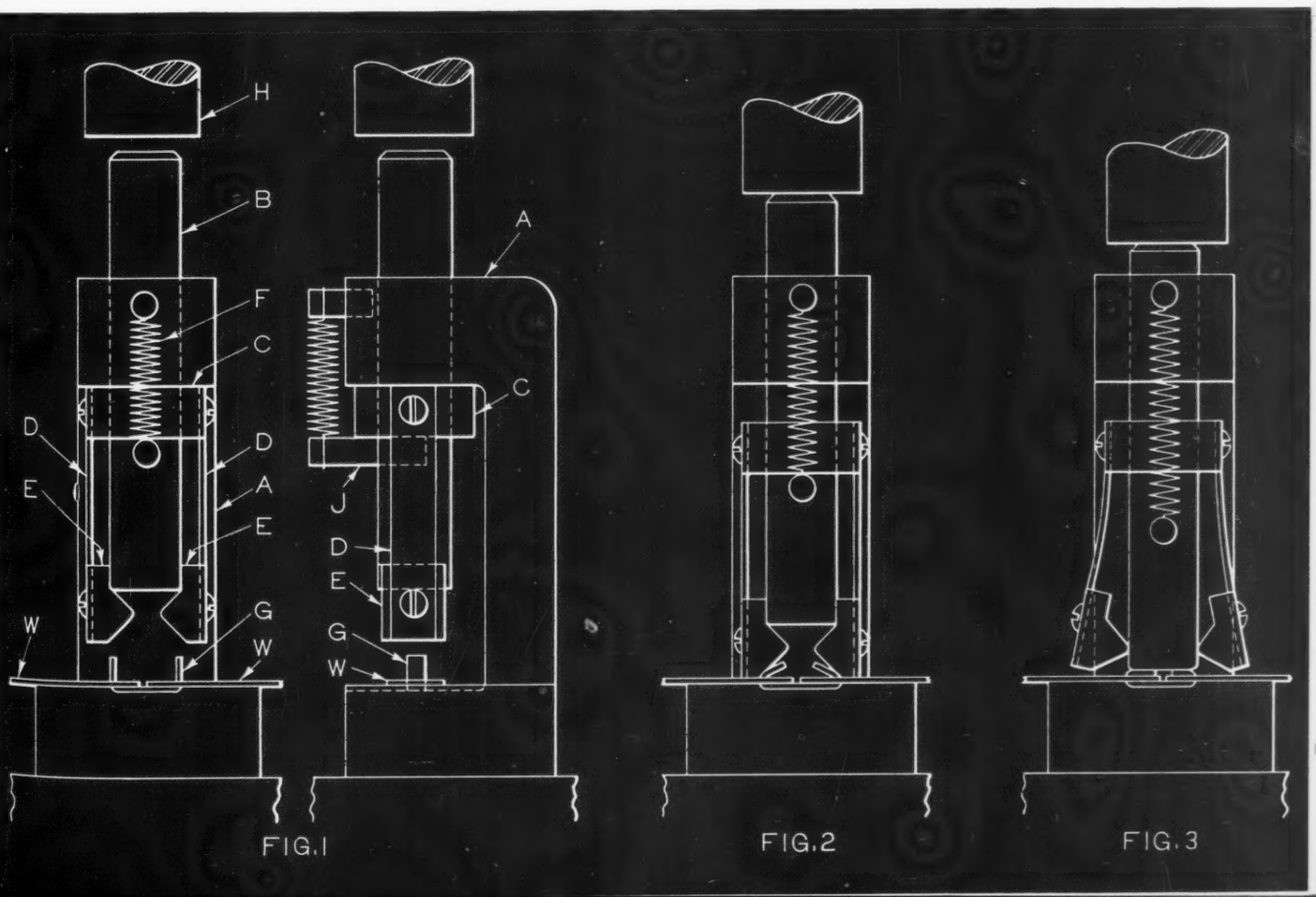
By L. KASPER, Philadelphia, Pa.

On a machine that forms products from coiled flat wire, considerable time was saved by connecting the end of the used coil in the machine to a new coil with the stapling attachment here described. This method has minimized "down time" of the machine by eliminating the need for threading the end of the new coil through the machine, which is quite long and contains many small piercing and forming dies and stock guides.

With the present method, a small rectangular hole is pierced in the end of each wire. The legs of a U-shaped, flat wire staple are pressed into these holes, and then clinched with the attachment illustrated. The rectangular holes are so located in the stock that the clinched staple will not interfere with the feeding of the wire or operation of the machine. It is merely necessary to discard the stapled section when it is discharged from the machine.

As shown in Fig. 1, staple *G* is inserted into the holes pierced in the ends of wires *W*, and is located in a groove provided in the base of casting *A*. Plunger *B*, which has a square cross-section, is a slide fit within casting *A*, and is normally held in its upper position by spring *F*. Part *C*, which is a slip fit over plunger *B*, is held in the position shown by pin *J* projecting from the plunger. Flat springs *D* are fastened to part *C* by screws, and each spring carries a form-block *E* at its lower end. The stapling attach-

Fig. 1. Front and side views of a stapling attachment employed to connect the ends of flat coiled wire (W) by clinching the legs of staple (G). Fig. 2. As plunger (B), Fig. 1, moves downward, the ends of the staple are bent inward by the lower angular surfaces on form-blocks (E). Fig. 3. Plunger (B), continuing downward, forces blocks (E) apart and flattens the staple



ment is mounted in a small press, ram *H* of which actuates plunger *B*.

As the press ram *H* descends, part *C* is carried downward with plunger *B* by the spring pressure of blocks *E* against the lower end of the plunger. When the lower angular surfaces on the form-blocks contact the ends of the staple, the tension of flat springs *D* is sufficient to resist spreading, and the ends of the staple are bent inward as shown in Fig. 2.

When the under sides of blocks *E* contact wires *W*, no further downward movement of part *C* is possible. Continued downward movement of plunger *B*, however, causes blocks *E* to spread apart, Fig. 3, by acting on their upper angular surfaces. The plunger can then pass between the form-blocks and flatten the staple. On the up stroke of the press ram, the parts of the stapling attachment return to their original positions.

Universal Air-Operated Fixture for Staking and Embossing Small Parts

By EDWIN MOSTHAF, Industrial Consultant
Huntington, W. Va.

Many shops that require staking, prick-punching, embossing, and marking of small parts either use a bench type punch press or make up a hand-operated fixture for each job. A simple method of accomplishing these operations is provided by the universal air-operated fixture illustrated in Fig. 1. This device considerably reduces tool costs and gives high production rates, in addition to decreasing danger of injury to the operator incident to punch press operation, especially when unskilled men are employed.

The fixture consists mainly of two standard air cylinders *A* and *B*, which may be modified to suit conditions and which are used for clamping the work, as well as performing the operation. The design of the assembly is such that the air cylinders and workholder *C* are adjustable, and the universal swivel mounting on the bench bracket permits the positioning of the unit at any angle.

In operation, the work is placed in the holder *C*, which should be so designed that the shock of the operating blow is absorbed by the fixture instead of being transmitted to the lower piston. This aids in maintaining a uniform marking depth. A two-way valve is then depressed, allowing air into the lower cylinder *A*, which raises the piston to clamp the work by means of cam *D*. At the end of this stroke, a small hole *E* in the cylinder wall is uncovered, allowing the compressed air to pass to the upper cylinder *B* through a hose connection *F*. This air pressure actuates the top piston which performs the working stroke.

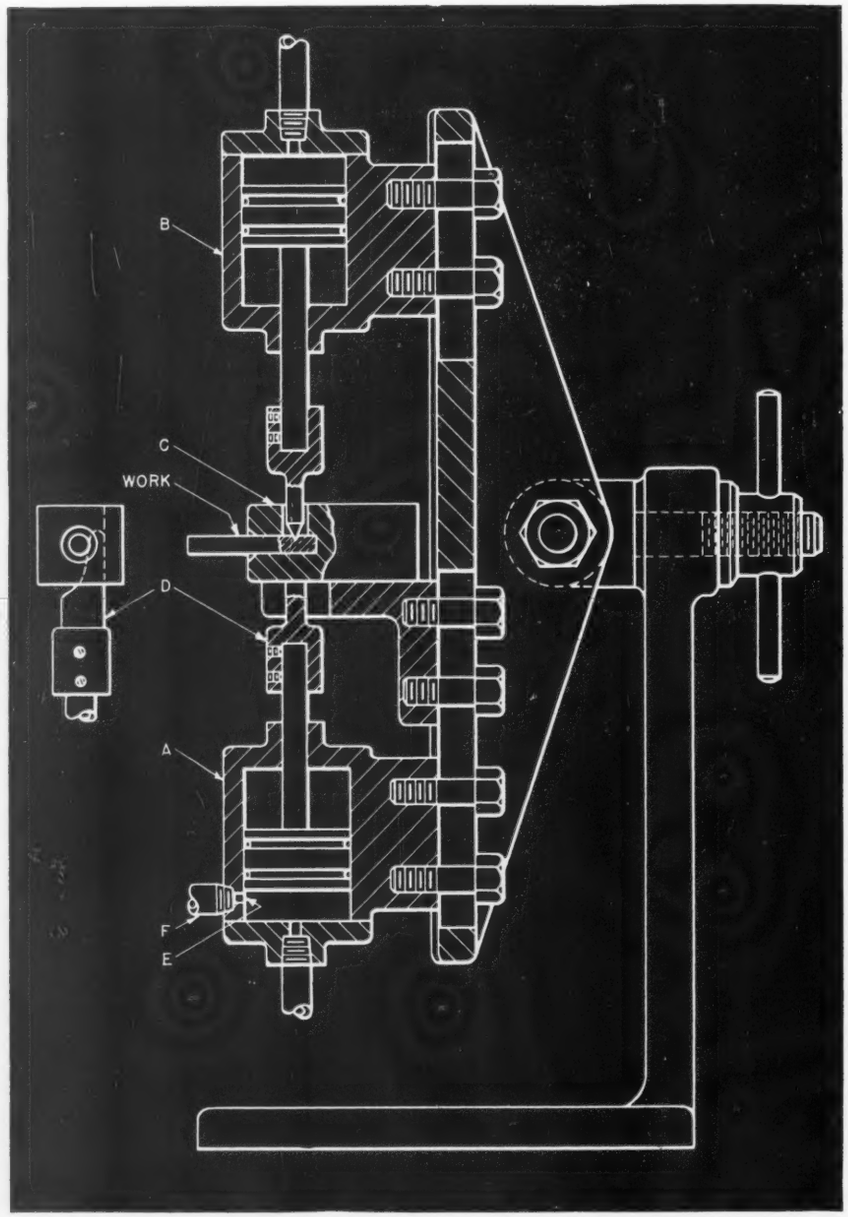


Fig. 1. Bench type, air-operated fixture that eliminates special tools and the use of punch presses for staking, embossing, and prick-punching small parts

Reversing the foot-valve allows air to enter both cylinders, forcing the pistons back to their normal or open positions.

An air-pressure regulator and an air gage should be used to provide flexibility of the clamping and striking pressures. Fig. 2 illustrates a typical bench installation for this unit, and more clearly shows the air circuit required.

Fixture Designed to Machine Radii on Different Sizes of Hose Nipples

By ROBERT W. NEWTON, Assistant Chief Tool Designer
New York Air Brake Co., Watertown, N. Y.

Hose nipples of different sizes and designs were completely machined in an eight-spindle automatic screw machine except for a radius that had to be formed on one end, so that the rubber hose used with these parts would not be torn by sharp corners or ragged edges. The amount of work necessary to complete one of these nipples on the automatic made it impractical to form the radii also in that machine.

The fixture shown in the illustration on the next page was designed for machining this radius on all the different sized hose nipples in a drill press to avoid tying up a four-spindle automatic screw machine, which would ordinarily be used for the second operation. An adjustable-blade, high-speed steel hollow-mill *A* was employed to form each radius. The use of this fixture and cutter has proved an efficient and inexpensive method of performing the second operation, since the radii formed on the ends of the hose nipples are smooth and the operation is completed in a reasonable length of time.

The fixture consists of a plate *B* with four work-holding positions, which provide for locating the parts so that all the different sizes of hose nipples can be machined, one or more sizes being handled in each position. Four counterbored holes are machined in the plate to receive the work. The hole in each position is made large enough in diameter and deep enough to clear the threaded end of all the work-pieces to be machined in that position. Locating plugs *C*, *D*, *E*, and *F* are driven into the bottom of the counterbored holes, and are made long enough to fit into holes drilled through the nipples.

At each position, three pins *G* are driven in place to permit the hexagon shape of the nipples to fit loosely between them. These pins, bearing against the hexagon-shaped section of the nipple, prevent the work from turning during the operation. A 1/2-inch socket-head cap-screw *H* is so located that when the work is placed in the

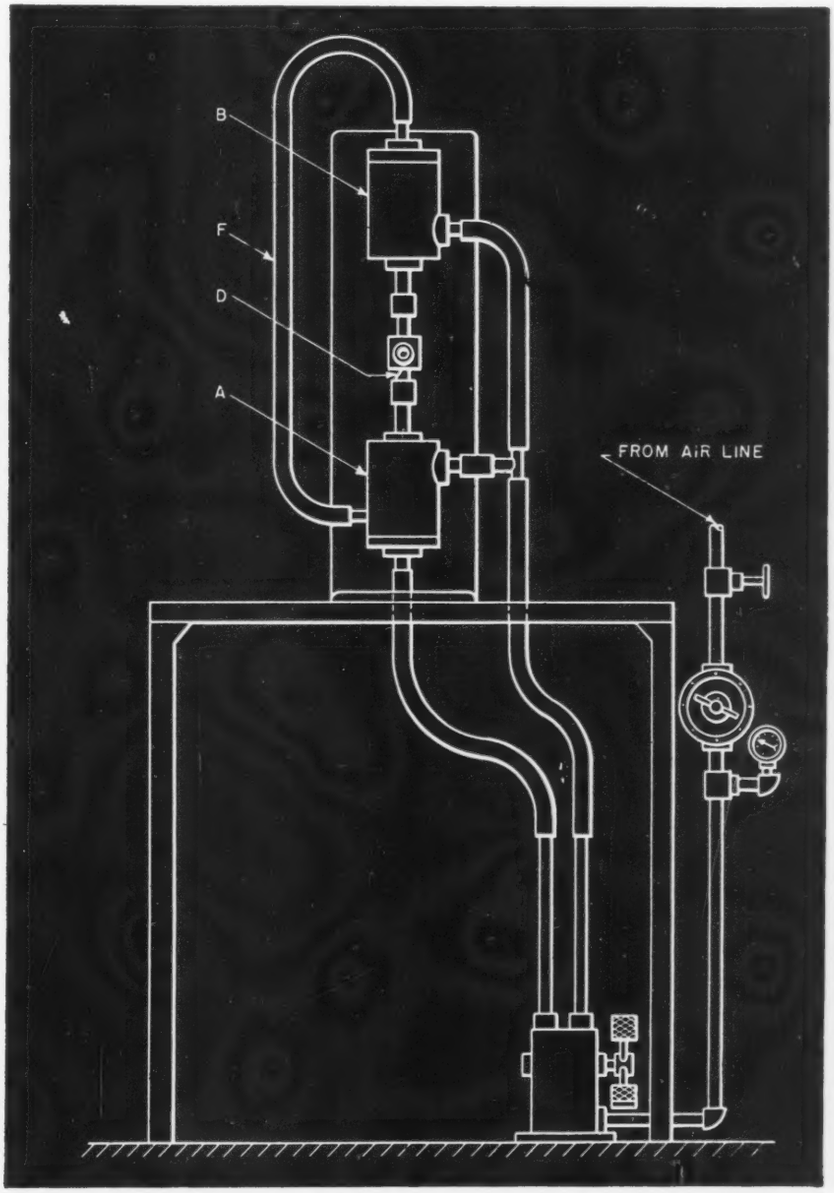
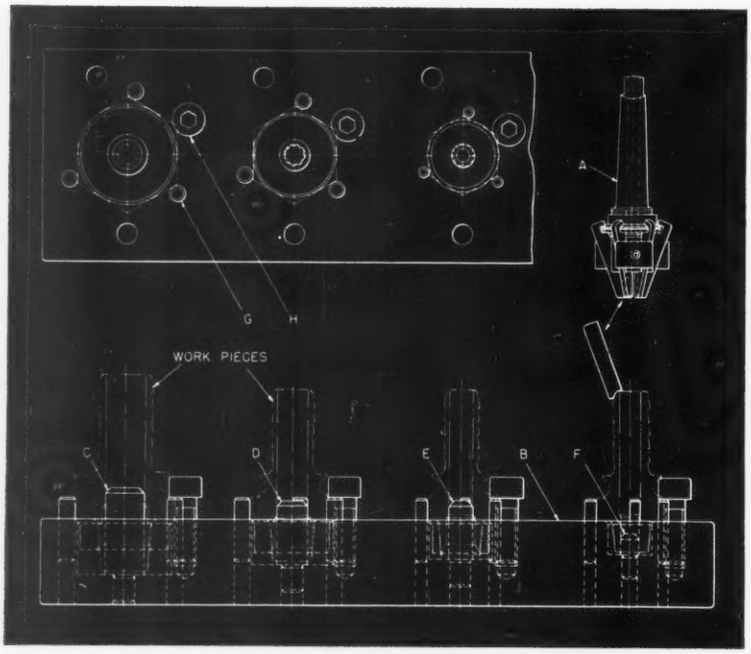


Fig. 2. Typical circuit for air-operated fixture illustrated in Fig. 1. This installation is economical to operate and provides high production rates



Fixture that provides an efficient and inexpensive means of milling radii on hose nipples in a drill press

fixture with the hexagon section against the three pins, one corner of the flat upper surface will be under the screw-head about 3/32 inch. These screws do not need to clamp the work tight, since the three pins hold the nipples sufficiently to permit the radius to be formed satisfactorily. Two holes, equally spaced from the center, are drilled in the plate at each position for cap-screws and two corresponding holes are tapped in the drill press table, so that the fixture can be clamped under the spindle of the drill press for machining a hose nipple in any of the four positions.

Several different sizes of commercial adjustable-blade hollow-mills were used to take care of all the hose nipples. As shown in the illustration, each blade in the cutter is ground to the correct radius, with a clearance angle on the side that is greater than the angle of the end serration of the work-piece, so that the radius will blend in smoothly with the previously machined form. When the blades are ground, a generous land of 1/32 inch is left to eliminate chatter. A slow spindle speed was used on the drill press in order to obtain a smooth finish.

* * *

Whenever a grinding wheel breaks, a careful inspection should be made to make sure that the protecting hood has not been damaged and that the flanges have not been bent, sprung out of true, or sprung out of balance. The spindle and nuts should also be carefully inspected.

Westinghouse Materials-Handling Conference

The third biennial Materials-Handling Conference, sponsored by the Westinghouse Electric Corporation, will be held in Buffalo, N. Y., on October 24 and 25. The first day's sessions will take place at the Hotel Statler, while the second day's program will be presented at the Westinghouse Buffalo plant.

Among the papers to be presented at this conference are the following: "Coordination of Engineering and Materials-Handling in the Fisher Body Division, General Motors Corporation," by E. R. Frost, Director of Materials Handling, Fisher Body Division, Detroit, Mich.; "Classification of Materials-Handling Factors," by H. H. Hall, of the Aluminum Co. of America, Pittsburgh, Pa.; "Influence of Material on Future Design," by F. R. Benedict, of the Westinghouse Electric Corporation, Pittsburgh, Pa.; "A New Concept of Alternating-Current Crane Control," by F. P. Taugher, of the Westinghouse Electric Corporation; "Electrical Requirements of Hoists," by Frank Lock, of the Yale & Towne Mfg. Co., Philadelphia, Pa.; "Safety Requirements of Portable Conveyors," by R. F. Tomlinson, of the A. B. Farquhar Co., York, Pa.; "Problems Confronting the Export Market," by W. Chapman, of the Westinghouse Electric International Co., New York; and "The New Life-Line Type SK Motor," by E. C. Watson, of the Westinghouse Buffalo plant.

* * *

Grinding Chasers for Threading Aluminum Parts

Thread chasers for use in self-opening die-heads to machine aluminum alloys should be ground with about a 20- to 30-degree hook, according to the *Technical Advisor,* published by the Reynolds Metals Co., Louisville, Ky. Also, the chasers should be set sufficiently above the axis of the work to give an effective top rake of 30 to 40 degrees. A spiral angle ground into the lead end of the tool will help prevent chip build-up within the die-head. A side rake of 8 to 10 degrees will assist cutting. A lead chamfer of 25 to 35 degrees extended back about one and one-half to two threads will guide the tool in starting and will produce smoother, more accurate threads.

Ideas for Shop and Drafting-Room

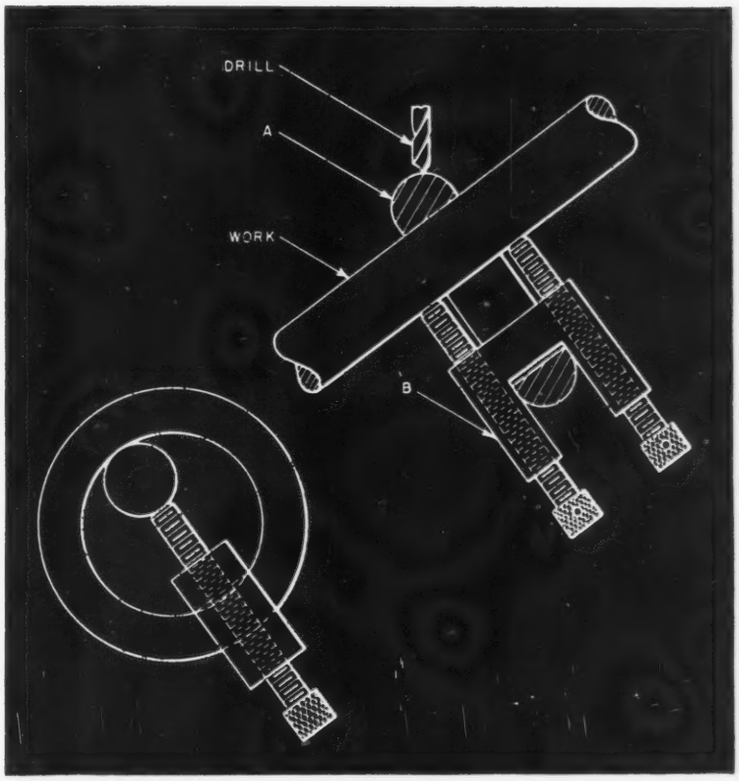
Kink for Drilling Angular Holes

By H. MOORE, Hamilton, Ontario, Canada

The collar and clamp shown in the accompanying illustration considerably facilitate the drilling of angular holes by presenting a horizontally positioned surface for the drill to enter, regardless of the angle at which the hole is to be drilled in the work.

The collar *A* is rounded off to a radius depending upon its thickness, and has an inside diameter large enough to suit work of a reasonable size. The clamp *B* is machined to fit snugly against the sides of the collar, thus keeping the two tightening screws in line.

When the work is set up at the required angle in a toolmaker's vise, it is correctly positioned for the operation by bringing the drill down to contact punch marks made in the work to locate the hole. The vise is then clamped securely to the drill press table and the collar and clamp slipped over the work. The clamp is tightened when the collar is contacted at its highest point by the end of the drill. After drilling half way through the work, the device is removed and the drilling operation completed.



Collar and clamp that facilitate drilling holes at an angle

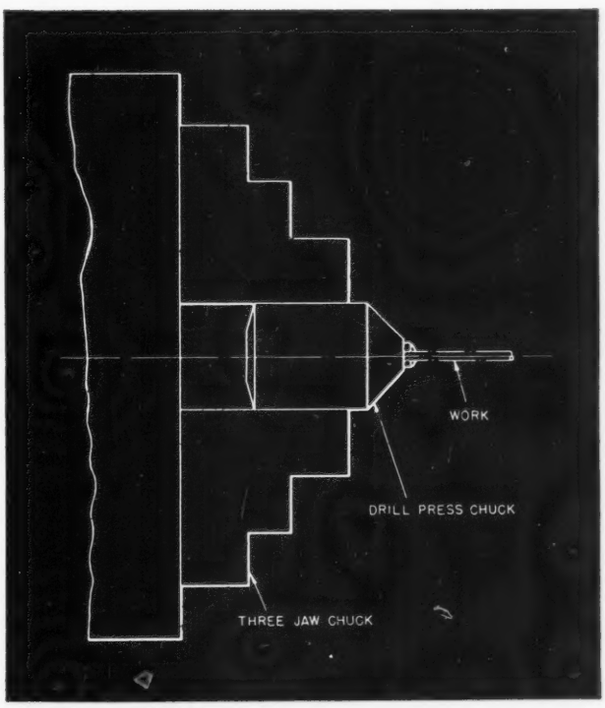
This device was primarily designed for occasional jobs. It can be used indefinitely by drilling all around the periphery of the collar. New collars can be made for use with the original clamp.

Small Work Held in Large Chuck

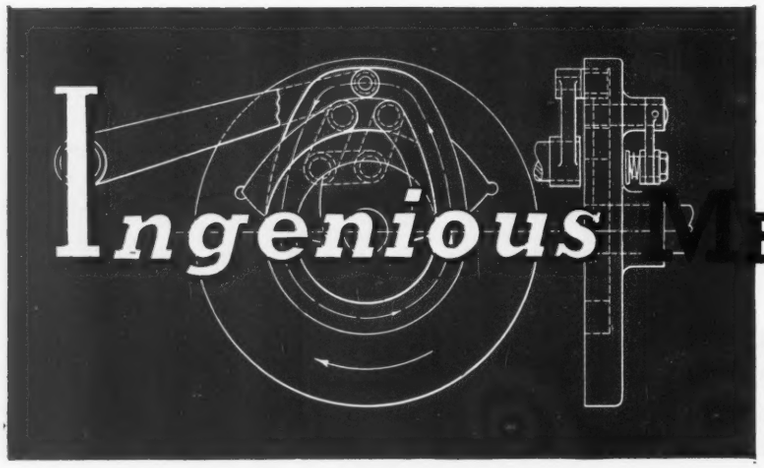
By IRVING MANSFIELD, New York City

Frequently small-diameter rods or wires must be held in the chuck of a large lathe when small lathes are not available. Usually, the large chuck is so made that the jaws cannot be closed sufficiently to clamp such small work.

A simple solution of this problem is to clamp a drill press chuck in the large lathe chuck, as shown in the accompanying illustration. In this way, the work can be loaded directly into the drill press chuck and unloaded without removing the drill chuck when the work is changed.



Drill press chuck employed to hold work that is too small to be clamped in a large lathe chuck



Ingenious MECHANISMS

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and other Devices

Rotating and Sliding Mechanism Used in Polishing Rectangular Frames

By B. SPECTOR

The mechanism shown in the accompanying illustration was designed to provide the required motion for polishing a rectangular metal frame on all four sides, as well as on the faces adjoining those sides. The diagram in the upper right-hand corner indicates the movement of the frame relative to the wheel *W* during the polishing operation. The frame is indicated by dot-and-dash lines.

In operation, the frame moves along line L_1L_2 in the direction indicated by arrow *A* until point C_2 is at the fixed point C_1. This movement of the work past the wheel results in polishing surface *1*. The frame then turns 90 degrees in a clockwise direction, as shown by arrow *B*, and surface *2* passes the fixed point C_1 in the same way that surface *1* did. Surfaces *3* and *4* pass point C_1 in a similar manner. After the entire periphery of the frame has been polished, the mechanism automatically stops for reloading.

The four intersections of the sides of the rectangle—points C_1 to C_4—are the centers of the 90-degree angle of rotation at the end of each stroke. These points are analogous to the centers C_1 to C_4 shown in section *B–B*.

Cross-section *A–A* shows the work in dot-and-dash lines, mounted on a rotating and sliding nest *RN*. Surfaces *1*, *2*, *3*, and *4*, of which *1* and *3* can be seen in this view, are to be polished. The adjoining faces *1′*, *2′*, *3′*, and *4′* are also to be polished, and for this reason, the wheel *W* is mounted at an angle, as indicated.

Essentially, the mechanism consists of a stationary frame *FF* and *F′F′* in which are bearings for the drive-shaft *G* to which is fastened a gear *H*. Rotating slowly and at constant speed, gear *H* meshes with gear *I* to drive a shaft *J* on which is mounted a pinion *D*. Other members of this assembly include a sliding guide *SG* and the rotating and sliding nest *RN* previously mentioned. The thrust of the polishing wheel is absorbed by a support *Z*. The nest slides (and rotates at the end of each stroke) within the space *C*, section *X–X*. Four pins C_1, C_2, C_3, and C_4 are a drive fit in this nest, pins C_1 and C_3 being shorter than the other two.

At the beginning of the polishing cycle, in the position shown, pin C_1 coincides with the center of pinion *D*, which is in mesh with one-quarter segment E_1 of an internal gear. The number of teeth in this gear is divisible by 4, which provides an equal number of teeth in each of the four segments E_1, E_2, E_3, and E_4 of the internal gear. These segments are connected by racks F_1, F_2, F_3, and F_4, the means of fastening these members being omitted in the drawing for the sake of clarity.

Nest *RN* slides in the direction of the arrow on two pins (in this position, C_1 and C_2) which ride in a slot *K* between liners *L* and *M* (sections *X–X* and *Y–Y*). The upper liner *L* is a continuous unbroken strip extending along the entire length of the slide guide *SG*, while liner *M* is cut through at *N* and N_1, as may be seen in section *B–B*. At *N* (see section *Y–Y*), this recess is one-half the width of the liner *M*, so that the longer pins C_2 and C_4 pass over it, while the shorter pins C_1 and C_3 drop through it for the 90-degree rotation of the frame. The recess at N_1 extends the full width of the liner, thus permitting both short and long pins to enter slot *K* in the slide guide as they move upward along line P_1–P_2. It will be noted that this slot is angular in cross-section, having a separate piece that moves under spring pressure to close the slot after a pin has passed through it. This provides a smooth, unbroken surface for the pin to travel on after entering slot *K*.

In operation, the engagement of gears *H* and *I*

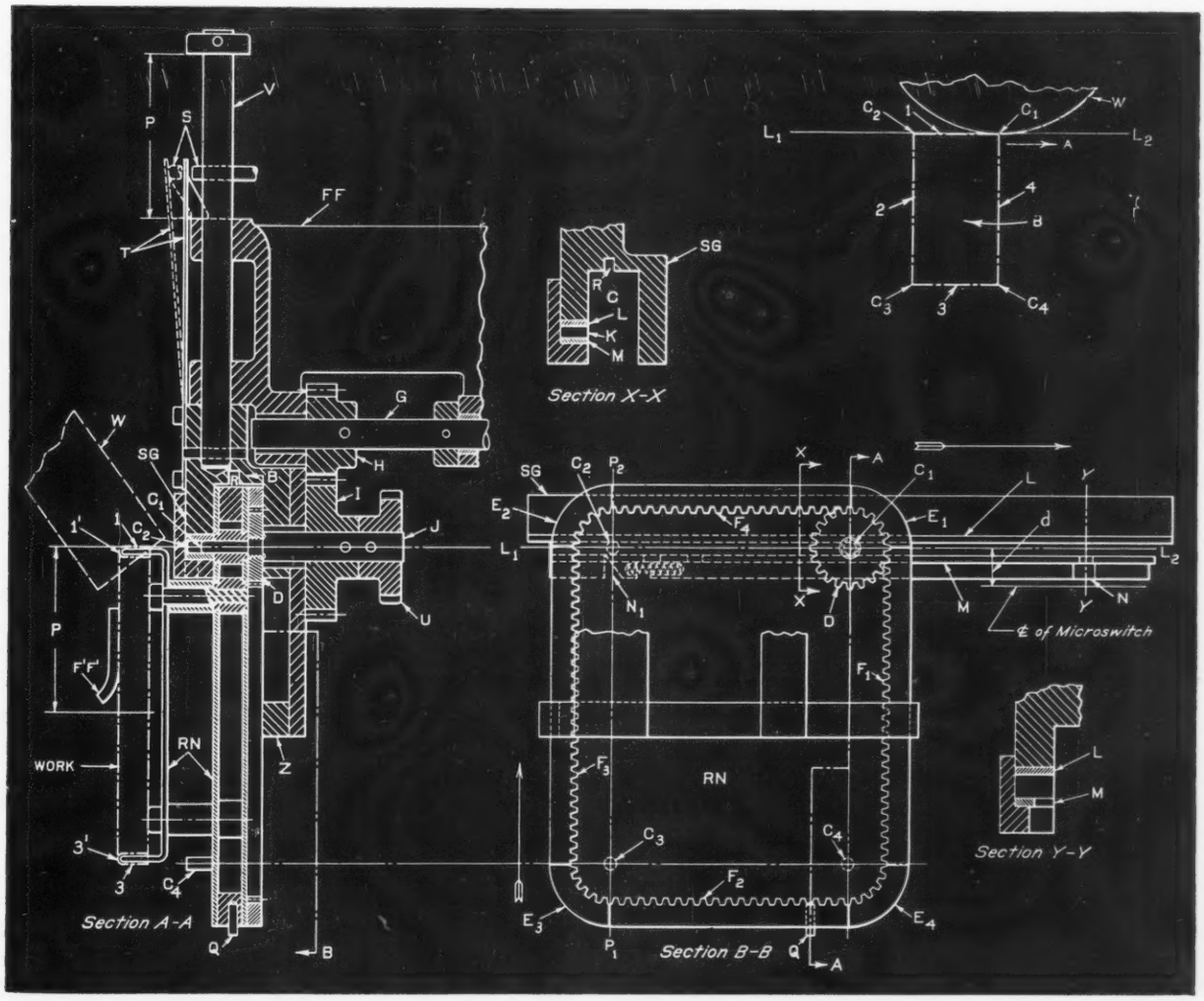
rotates pinion D, which, after disengaging gear segment E_1 engages rack F_4. This moves nest RN along line L_1L_2, in the direction indicated by the arrow, until the pinion engages the second gear segment E_2. By that time, the short pin C_1 is at N and drops through the opening, thereby turning nest RN in a clockwise direction until pin C_3 enters the guide strip through the opening at N_1 which confines the angle of rotation to 90 degrees.

Inasmuch as the pinion has been rotating continuously, it has moved gear segment E_2 around and is engaged at this point with rack F_3, in position to slide the nest along line L_1L_2. Since this side of the frame (designated surface *2* in the diagram in the upper right-hand corner of the illustration) is longer than the side just polished (surface *1*), a longer stroke is required. This is accomplished by the longer pin C_2 passing over the half opening in liners L and M.

Rotary motion through a 90-degree angle occurs when pin C_2 reaches the end of the slide guide, at which point pin C_4 enters the guide at N_1, and movement along line L_1L_2 again takes place. This procedure is followed for the remaining side, so that the frame rotates and slides four times in one complete polishing cycle.

At the completion of a cycle, gears H and I are disengaged automatically to stop the movement of the mechanism and permit unloading and reloading of the work. The first step in this automatic action occurs when a pin Q (pressed into the rotating nest at a location farthest from point C_1) contacts a micro-switch (not shown) moving it a distance d. A slot R (section X–X) in the slide guide provides clearance for the pin during its travel along line L_1L_2. The micro-switch energizes a solenoid that moves a rod S, disengaging a spring steel latch T which is connected to slide guide SG and nest RN. The slide guide and nest then drop, by reason of their unsupported weight, a distance P, traveling along two guide rods V (only one of which is shown), thereby disengaging gears H and I.

After reloading the nest, the operator raises the nest and guide by means of a knob U, bring-



Rotating and sliding mechanism designed for automatically polishing the periphery and faces of rectangular frames

ing the assembly to the position illustrated. Since gear *H* rotates very slowly, its reengagement with gear *I* is a simple matter.

It is evident that this mechanism can be applied to any polygon. If it is employed for a regular polygon, the short pins C_1 and C_3, as well as slot *N*, may be eliminated and four (or more) long pins used, which would drop after reaching the end of slot *K*.

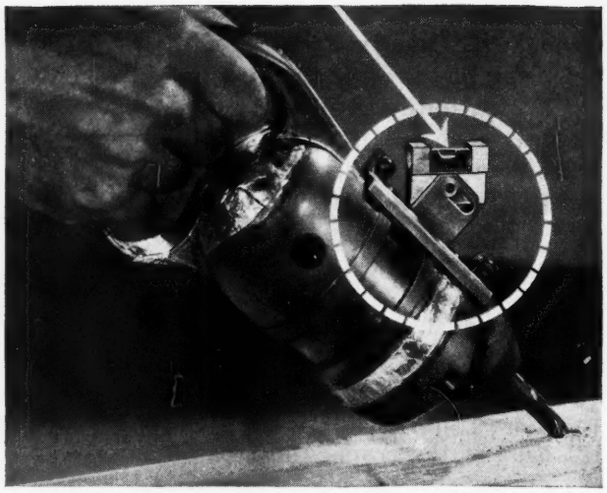
* * *

Multiple-Station Electrolimit Gage Checks Three Hundred Eccentric Shafts an Hour

All critical dimensions of an eccentric shaft that must meet close tolerances are checked simultaneously on the Pratt & Whitney Electrolimit gage shown in the accompanying illustration. The gage inspects diameters, bearing concentricity, bearing taper, and throw of eccentric in a single operation. Formerly the various elements were checked by the use of individual Electrolimit gages.

In checking work, the operator merely loads the part into the gage, notes the dial readings, and unloads, the gaging being completely automatic. To check the eccentric shaft, the operator places it in a cradle at the front of the gage and presses a button. The part is automatically conveyed to the gaging position, where it is rotated by an electric motor between contact fingers. This actuates the dials, which are calibrated in hundred-thousandths of an inch. Limit hands show at a glance whether the parts are within the specified tolerance. When the operator has completed the readings, she releases the button and the shaft is automatically ejected.

Checking diameters, bearing concentricity, bearing taper, and throw of an eccentric shaft at one time on a multiple-station Electrolimit gage



Drilling hole at angle, using electric drill equipped with adjustable level attachment

Level Attachment Facilitates Drilling Holes at any Desired Angle

An ingenious level attachment for portable electric hand drills that enables anyone to drill straight holes horizontally, vertically, or at any angle through floors, ceilings, timbers, metal, or masonry is shown in the accompanying illustration. This "Midget Ken-Drill" level attachment, as it is called, is a recent development of the Singer Kennedy Corporation, Chicago, Ill. It has a slotted base 3 inches long, 1 1/2 inches wide, and is made of aluminum. A slotted holder with hand set-screw which contains a 1 3/8-inch protected bubble-level unit that may be securely set at any desired angle up to 90 degrees is mounted on the center of the base.

The cut-off corners of this holder permit it to be instantly set for vertical, horizontal, or 45-degree angles. Settings for intermediate angles can be made by adjusting and tightening the hand set-screw. The attachment can also be mounted on any electric or pneumatic drilling machine.

In use, the level is first set to the angle at which the hole is to be drilled, or if the hole is to be vertical, the level unit is swung around to the forward position, and the hand set-screw tightened. Then it is only necessary for the operator to keep the drill so positioned that the bubble of the level remains between the two guide lines.

* * *

Aluminum is now being produced in the United States at the rate of approximately 1,450,000,000 pounds a year, which is more than 17 per cent greater than the production in 1949.

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER
Lester and Silver
Sales Management Engineers
New York and Philadelphia

Selling Ourselves to People

THREE friendly machinery and tool salesmen met one evening in the hotel of a town in which was located a large plant for manufacturing agricultural machinery. The three fell to talking about the success they had experienced with this concern.

"Yesterday I obtained a nice order from Phil Ross, the superintendent, and his buddies," proudly exclaimed one of them.

"I sold a couple of drill presses just last week," said another.

"Last month they bought a tool-room lathe from me," added the third.

If the words each salesman expressed carried only a single thought, what happened? The first sold a man and his associates. The second sold tools. The third had his offer accepted.

Assuming that the three expressions are exact and complete in themselves, which of the three men was doing the best job? Or, over the years, would you rather be the salesman who can sell people, the salesman who can sell machines, or the one who gets his bid accepted? All three result in sales, but there is a difference in approach as we focus our thought on people, things, and systems.

For my part, I would rather have the ability expressed by the first salesman—the ability to sell people. If you can sell people, in the long run, you must, of necessity, know everything about the machine—its construction, operation, and application—as well as be able to furnish a system of service which will lead the customer to do business with your firm.

In order to be successful, any of us must combine these three skills—ability to sell the individual, to sell the particular tool, and to gain acceptance and preference through company performance. Without any one of them, our average of failure is too high.

The spearhead to selling rests upon "selling" ourselves to other persons. If we can't do this, we are following a rough, uphill road. We don't get a chance to sell our technical ability or our company service, unless we first sell ourselves. The head of a large department store on Fifth Avenue in New York City once said: "My greatest problem in selling to the public is to get my sales people to take an interest in the individual customer."

We continually forget the key ideas that successfully sell people. They apply in bad times as well as when business is augmented by a surge from military demand. They are worth repeating here, as follows:

1. Be pleasant, yet serious.
2. Get down to business quickly.
3. Choose the best level of approach to meet the man we talk to without wearing a "high hat."
4. Adjust ourselves to the individual and tune the sales appeal to his interests.
5. In answering pertinent questions, be frank and honest. Admit lack of exact knowledge and get the desired information as soon as possible.
6. Exalt both the position and knowledge of the prospect. Everyone likes to have his importance recognized.
7. Clinch sales arguments step by step, illustrating, selecting, and emphasizing their importance according to the individual prospect and his problems.
8. Don't talk too much.
9. Don't stay too long. Leave the individual anxious to see you again.
10. Express warmth and appreciation, but don't for a minute let the individual think he's doing you a favor by listening.

Repeatedly, salesmen brag, unconsciously perhaps, of their closeness to certain key individuals engaged in buying. But remember that each

year an average of over one-third of every thousand people in a buying position move on. Neither people, attitudes, nor friendships "stay put." Friendships must be aggressively developed and maintained by selling oneself to other persons.

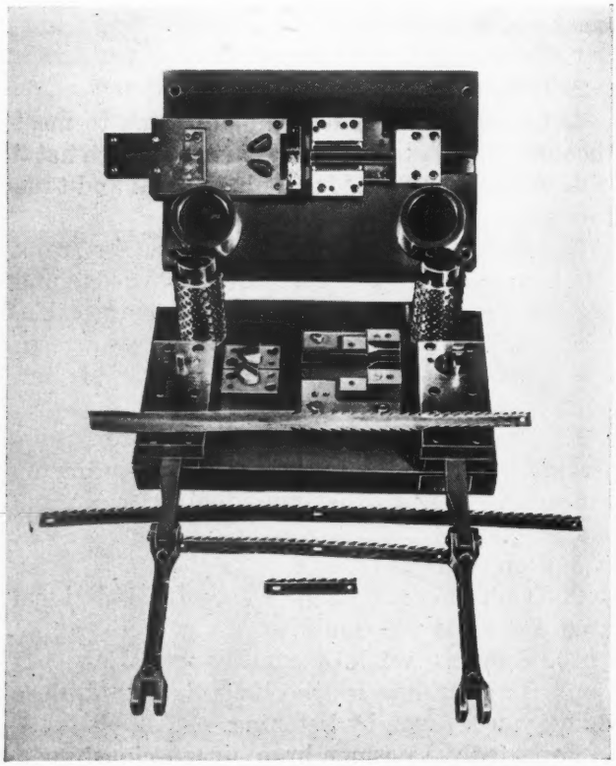
* * *

Carbide Dies Reduce Cost of Producing Channel-Shaped Part

The use of carbide dies for both blanking and forming has solved a troublesome production problem for the John E. Mitchell Co., of Dallas, Tex. The new carbide dies have virtually eliminated all costly press "down time" required for die changes during peak production, in addition to increasing the die life some sixty-five times.

The dies, shown in the accompanying illustration, are used for producing channel-shaped saw bands for Mitchell cotton cleaning machines. The channel-shaped saw-band is made from 0.030 inch thick cold-rolled C-1040 strip steel, purchased in rolls. The stock is fed from the reel into one end of the automatic saw-band machine in a horizontal position.

The oval hole in the channel saw is punched first. The blanking die then punches the teeth and the forming die gives the steel band its final channel shape. The round hole is next punched, after which the saw band is cut off to length.



Die used for production of channel-shaped saw band for cotton cleaning machines

The original steel blanking dies had to be sharpened at least once a day during the busy six months' season, whereas the Carboloy blanking die used in place of the steel die performed 20,000,000 blanking operations, or the equivalent of a normal full year's operation, before it had to be sharpened. Thus, more than thirty hours of maintenance time per machine is eliminated each year by the use of the carbide dies.

Although the initial sets of Carboloy blanking and drawing dies have not yet worn out, it is estimated that the life of the blanking portion of the die will be at least 100,000,000 blanks, compared with the 1,500,000 blanks for comparable steel dies—an increase in service life of more than sixty-five times.

The change-over from steel die sets to carbide dies was made without any radical departure from the original design. The carbide dies are made in sections for easier construction, whereas the original steel dies were in one piece. The punches and dies are made of shock-resisting Grade 55B Carboloy, while the drawing die is made of Grade 55A, which combines high toughness and abrasion resistance.

* * *

Slide-Rule for Checking Production Rates

The production rate of a job can be checked during operation with an inexpensive new type of slide-rule. Made of vinylite plastic rigid sheet that is resistant to machine oils and most chemicals, the rule will not warp or support combustion. It can be placed on the machine in full view of the operator.

Periodically, the number of pieces finished on a given operation are counted and the quantity interpreted in terms of earned hours. The hours earned are set on the movable scale of the unit directly below the number of hours worked. A green signal shows when productivity is above standard expectancy of 100 per cent, and a red signal indicates when productivity drops below this standard. In this way, a constant check can be maintained and costly troubles eliminated while the operation is still running. A recess in the slide holds job instruction slips. These slides are produced by R. G. Bock Engineers, Lincoln National Bank Bldg., 1951 Irving Park Road, Chicago 13, Ill.

* * *

More than 70 per cent of the families in the United States own automobiles, according to the Automobile Manufacturers Association.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

South Bend "Light Ten" Tool-Room Lathes

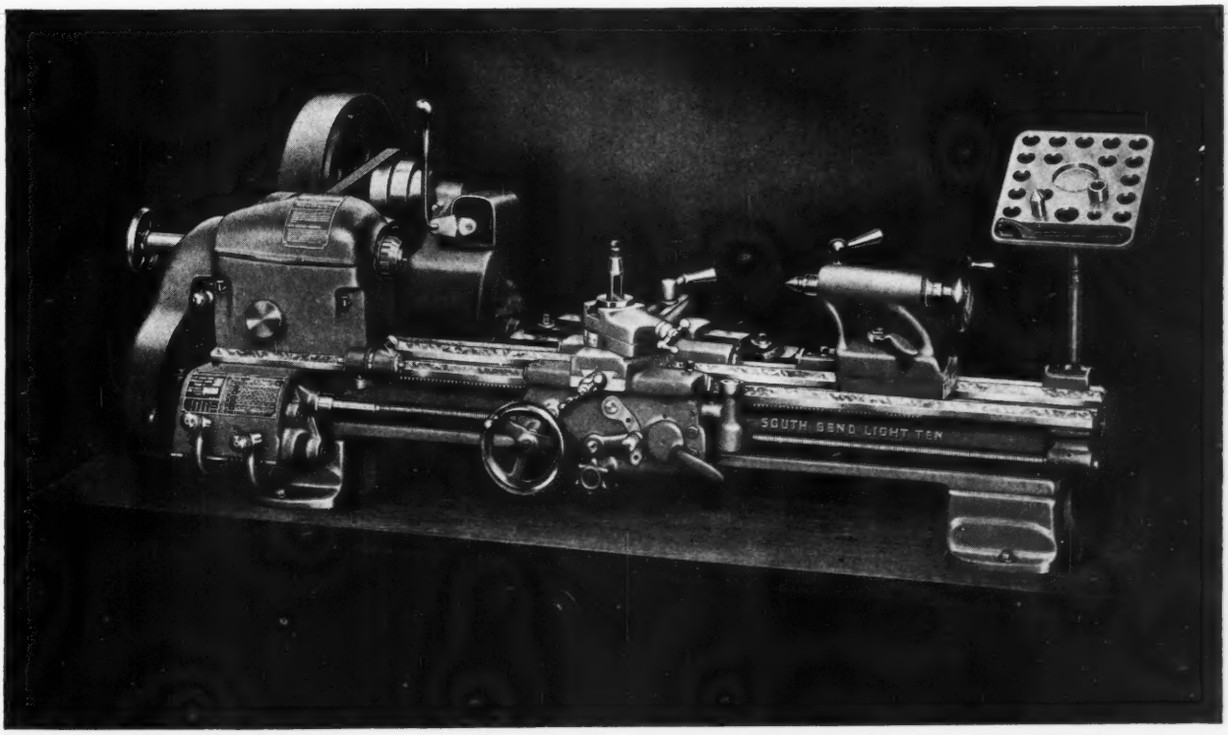
A new line of precision tool-room lathes, known as the "Light Ten," is now being manufactured by the South Bend Lathe Works, South Bend, Ind. These lathes take work up to 10 inches in diameter over the bed. The swing over the cross-slide is 6 1/4 inches and the distance between centers varies depending on the bed length. A 1/2-H.P. motor provides ample power for all work within the capacity of the lathe. The headstock is back-geared, providing spindle speeds ranging from 48 to 1435 R.P.M.

Designed primarily for precision tool-room work, this lathe has the advantage of taking less power and occupying less space than the larger, heavier sizes, yet it will perform any work within its capacity as well as it can be done on the larger machines. Large handwheels, micrometer-graduated feed-collars, and convenient controls reduce operator fatigue and help prevent mistakes. It is equipped with a precision lead-screw having 0.0015 inch or less lead variation in any one foot, a handwheel draw-in collet attachment (without collets), collet rack, taper attachment, thread dial indicator, thread cutting stop, and a micrometer carriage stop.

Regular equipment on this lathe includes a power feed apron; graduated compound rest; small faceplate; toolpost; two 60-degree centers; headstock-spindle center sleeve; and a quick-change gearbox providing a thread cutting range of 48 pitches (4 to 224 per inch right- or left-hand), and 48 longitudinal power feeds. A carriage lock is provided for precision facing operations. Other attachments, tools, and accessories can be supplied so that many jobs can be handled which ordinarily require special machines.

Bed lengths of 3, 3 1/2, and 4 feet are available with maximum distances between centers of 16 1/8, 22 1/8, and 28 1/2 inches, respectively. The headstock and tailstock spindles have No. 2 Morse taper centers. The maximum collet capacity is 5/8 inch, hole through spindle 27/32 inch, and swing over saddle wings 9 15/16 inches. The tailstock spindle has 1/10-inch graduations, a travel of 2 1/8 inches, and a top set-over of 5/8 inch. The cross-slide travel is 5 7/8 inches, and the angular feed of the compound rest is 2 1/4 inches.

The headstock, carriage, and tailstock are hand-scraped to fit the hand-scraped bed ways.....38



"Light Ten" tool-room lathe manufactured by the South Bend Lathe Works

To obtain additional information on equipment described here, use Inquiry Card on page 233.

Clearing Double-Action Hydraulic Press

A new line of heavy, double-action hydraulic presses is now being manufactured by the Clearing Machine Corporation, Chicago, Ill. These presses have two independent hydraulic circuits, one for the blank-holder slide and the other for the punch-slide, each with its own separate pump. This arrangement is designed to preclude the possibility of losses in blank-holder pressure during the punch stroke. The pressure on each corner of the blank-holder can be individually adjusted, making the presses ideal for eccentric or irregular draws, as well as regular drawing operations. Valves are used in the hydraulic circuits for reversal to insure quick return and accurate control of pressure.

An outstanding feature of these presses is the provision for slowing the movement of the punch-slide at the instant the blank-holder slide is picked up on the return stroke. This action eliminates the shock customarily encountered when the punch-slide picks up the motionless blank-holder. Another feature is the positive drive for both slides, which allows the gibbing to be set for a close sliding fit.

The extended gibbing of the punch-slide in the crown is advantageous when eccentric loading conditions are anticipated. The punch-slide gibs can be adjusted within the blank-holder slide, and the blank-holder itself is guided by deep gibs which can be regulated to compensate for wear.

The press shown in the illustration has a 72- by 108-inch bed and is arranged for an 18-inch draw and lift out, including redraw work using an inside blank-holder. Clearing presses of this type are available in any required size. They are suited to short-run or high-production work, depending on the capacity of the pumping equipment installed. 39

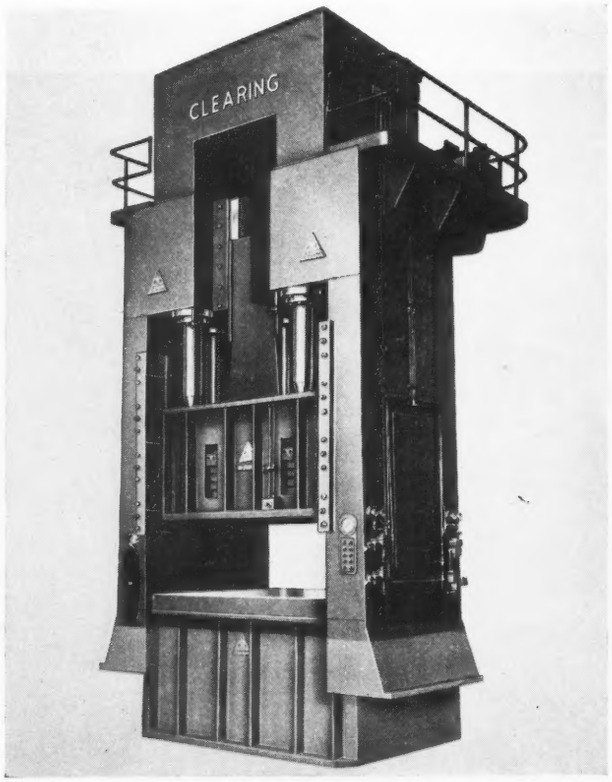
Duplex Centerless Type Polishing Machine

The Production Machine Co., Greenfield, Mass., has recently brought out a new "Four Eighty Four" duplex centerless polishing machine. This machine has been designed to meet the demand for equipment capable of producing a fine quality finish on small cylindrical work at high production rates. It is equipped with two polishing heads using abrasive, felt, leather, or fabric belts, depending on the finish desired.

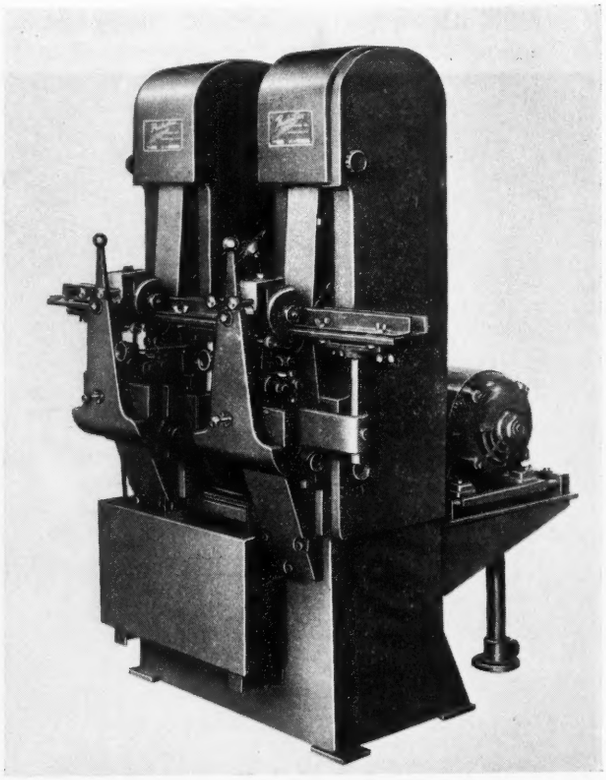
The machine has a capacity for handling work up to 1 1/2 inches in diameter, and will perform a two-pass polishing operation on metal, wood, fiber, plastic, and many other materials within its weight limitations. Only a single handling of the material is required and many parts can be fed to the machine automatically by means of hoppers or fixtures suitable for the job. 40

Sherman-Walder Automatic Precision Drilling Machine

Sherman Industries, Royal Oak, Mich., have announced a new precision drilling machine designed to provide stepless speeds and either manual or automatic operation. This machine is applicable to a wide range of drilling and tapping operations, and when furnished with suitable attachments, can be used for light precision milling and routing.

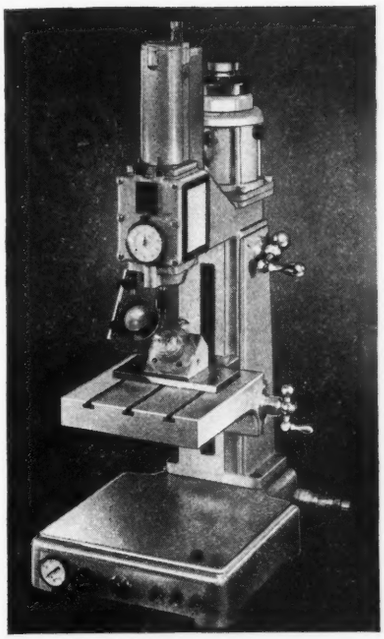


Double-action hydraulic press manufactured by the Clearing Machine Corporation



Duplex centerless polishing machine brought out by the Production Machine Co.

To obtain additional information on equipment described here, use Inquiry Card on page 233.



Precision drilling machine produced by Sherman Industries

The illustration shows the machine equipped with an indexing fixture for drilling tiny holes in spray-gun nozzles. Two micrometer dials, calibrated to 0.001 inch, are used to preset the electrical limit switches which control the fast traverse to dwell release as well as the maximum depth. The depth setting is so precise that registry can be repeated indefinitely without perceptible variations in the finished piece.

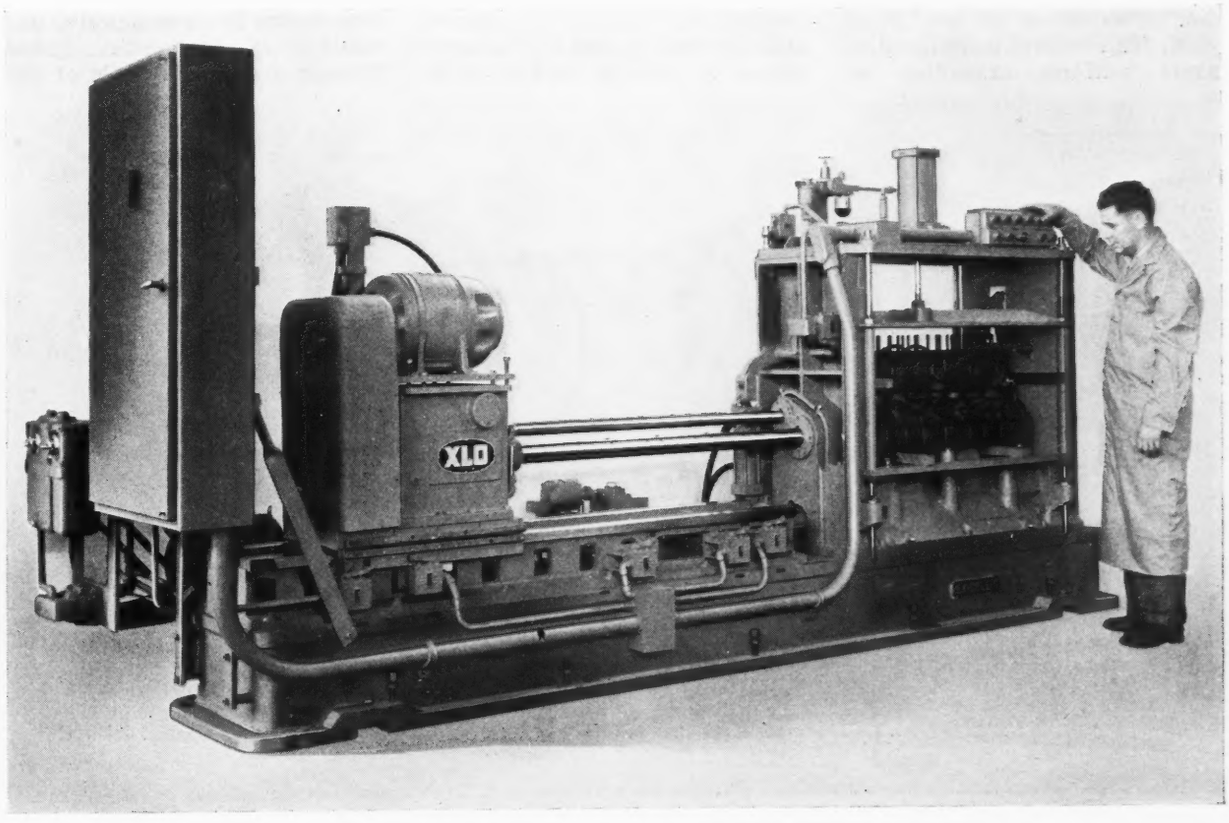
The power source is a governor-controlled electric motor which supplies stepless spindle speeds in a range of from 500 to 10,000 R.P.M. A relay actuates reversal of the motor during tapping. The table is reversed, raised, and lowered by means of precision screws provided with micrometer dials. Feeds are infinitely adjustable from 0 to 50 inches per minute to suit different materials.

Three interchangeable spindles are supplied, Type A being equipped with a collet chuck having a concentricity adjusting mechanism. Two collets are provided, which take drills from 0.002 to 0.020 inch in diameter and from 0.020 to 0.040 inch, respectively. The Type B spindle is equipped with a Jacobs chuck of 1/8-inch drill capacity, while the Type C spindle takes a 3/8-inch Jacobs chuck. The machine can be switched to automatic cycle operation when interlocked with a work-feeding mechanism for producing parts at high production speeds. 41

Ex-Cell-O Line-Boring Machine

An automatic-cycle machine has been brought out by the Ex-Cell-O Corporation, Detroit, Mich., for the simultaneous line-boring of crankshaft and camshaft bearings in engine blocks. This machine is built to maintain extremely close tolerances. The operator merely pushes the blocks into the fixture, presses the starting button, and removes the blocks at the completion of the cycle. The production ranges from twenty-five to thirty-five blocks per hour.

In some instances, it has been found advantageous to incorporate means for performing other precision boring operations in this machine, thereby keeping the additional bores accurately located with relation to the crankshaft and camshaft bores. Dowel-holes in the transmission end of the block and distributor-shaft holes are also sometimes machined at the same time that the line-boring operations are being performed on the work. 42



Ex-Cell-O machine for line-boring crankshaft and camshaft bearings simultaneously in engine blocks

To obtain additional information on equipment described here, use Inquiry Card on page 233.

"Lapmaster" High-Production Precision Lapping Machine

New "Lapmaster" production precision lapping machines will be demonstrated by the Crane Packing Co., Chicago, Ill., at the National Metal Exposition in that city. These machines are designed for consistent precision lapping of parts to a flatness within millionths of an inch and finishes of 1 to 3 micro-inches r.m.s., even by unskilled operators.

A combination conditioning ring work-holder rotates freely on the lapping plate. The number and size of the conditioning rings depend on the model. As the work is lapped, the conditioning rings actually lap the lapping plate—keeping it constantly in a perfectly flat condition. The lapping compound is fed to the plate from a compound-agitator tank by means of a feed track and solenoid valve. The lapping plate, agitator, and solenoid are all independently controlled and the entire lapping operation is automatically timed. The machines are manufactured in five sizes, with plates having lapping diameters ranging from 12 to 72 inches.

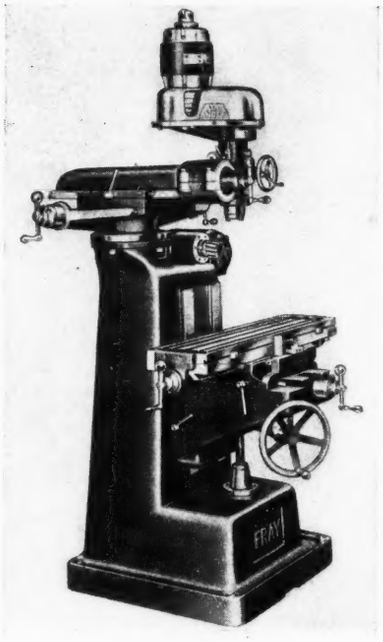
Another new product of this company known as the John Crane tube-rolling control, will also be exhibited at the Metal Show. This control is designed to insure uniform expanding of boiler tubes. In operation, current supplied to the electric driving motor is transmitted through the control. Since the torque load on the driving motor is a function of the correct degree of tube expansion, the control is designed to interrupt the current supply to the driving motor when the predetermined torque is reached. 43

Fray Universal Vertical Milling Machine

A new universal ram, vertical milling machine of the turret type, designed for use in shops requiring maximum flexibility and precision, is announced by the Fray Machine Tool Co., Glendale, Calif. Angle or compound angle work can be completed on this machine without changing the original work set-up. It will handle a complete range of work, including precision jig boring, drilling, tapping, keyway milling, end-milling, profile milling, die-sinking, plastic-mold routing, serrating, spotfacing, counterboring, punch forming, and spline milling.

Machining operations can be performed at any angle in both vertical and horizontal planes. Milling, drilling, and boring operations can also be performed at any angle longitudinally by traversing the ram on the turret-slide, or crosswise by operating the ram in its saddle.

The turret assembly permits extended ram adjustment, as well as any desired positioning of the ram on the horizontal ways, and rotation of the entire turret through a complete circle of 360



Universal vertical milling machine brought out by the Fray Machine Tool Co.

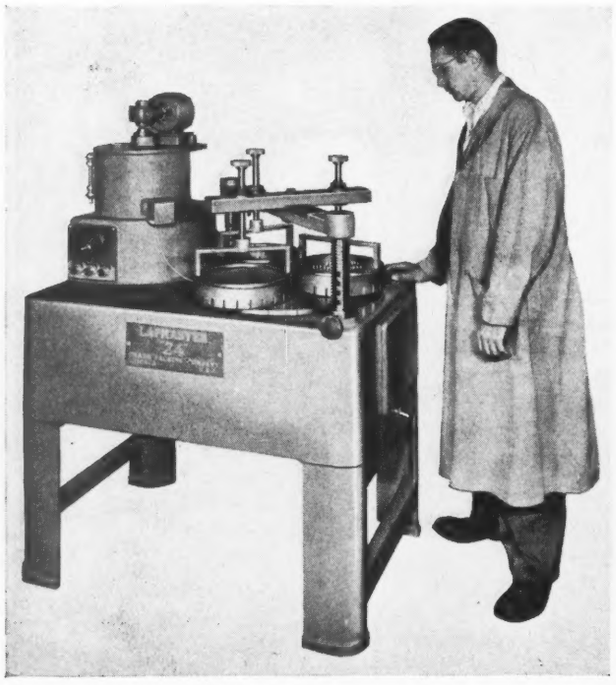


Fig 1. "Lapmaster" built for lapping parts up to 9 3/4 inches in diameter

Fig. 2. Bench model "Lapmaster" for lapping parts up to 4 1/4 inches in diameter

To obtain additional information on equipment described here, use Inquiry Card on page 233.

degrees. Further flexibility is obtained with the angle milling attachment, which rotates 360 degrees around the over-arm and 90 degrees forward or back.

The ram is operated by a ball-crank at the end of the feed-screw, the movement being determined by a 3-inch dial calibrated to 0.001 inch. Dials are also provided for all other ball-cranks and hand-wheels. The table has three machined T-slots, with channels and sump at each end for draining off coolant. Table stops are calibrated to 0.001 inch. 44

Raytheon Bench Welding Equipment

The Raytheon Mfg. Co., Waltham, Mass., will display a new line of bench welding equipment at the National Exposition and Congress in Chicago. This equipment is designed to weld many metals and combinations of metals previously considered impractical to handle by production methods. The units include the Model G "Weldpower" head, Models 60, 225, and 1100 stored-energy control units, and the Model 5-KVA alternating-current control unit. Model G head, in combination with control units 225 and 1100, will be shown in actual operation. 45

Hauser Precision Jig-Boring Machine

A new Swiss precision jig-borer is being introduced in this country by the Hauser Machine Tool Corporation, Manhasset, L. I., N. Y. This machine—the Hauser Type 5 jig-borer—has been designed to meet the needs of the automotive and aircraft industries for a machine of larger capacity than the jig borer previously introduced. Like the preceding model, the new machine is designed for maximum rigidity without excessive weight, the entire unit weighing only 7000 pounds.

All lead-screws of this machine are precision-ground from special stabilized steel, then optically checked for minor pitch errors, which are compensated for by correction bars. The slides can be accurately located to 0.0002 inch, and settings can be read to 0.0001 inch on the vernier scales. The maximum boring capacity is 9 inches, and the vertical travel of the boring spindle 9 inches.

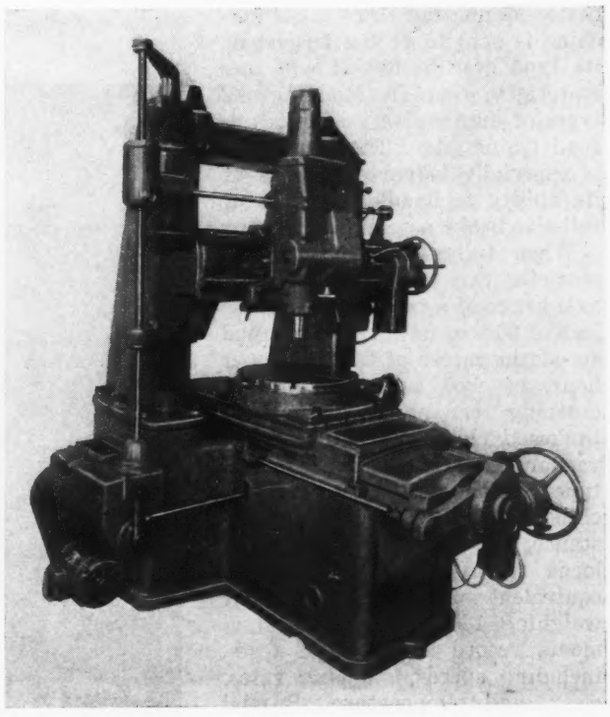
An individual electric motor drive actuates the table, vertical movement of the transverse slide, and transverse movement of the boring head. The table of the machine has a working surface of 29 1/2 by 24 1/2 inches. The table slide has a longitudinal travel of 28 inches, and the transverse travel of the boring head is 20 inches. The vertical travel of the boring spindle is 9 inches, and the maximum distance from the spindle to the table is 28 1/2 inches. The maximum distance between columns is 35 1/2 inches, and the diameter of the circular table 20 inches. The tilting circular table has a diameter of 12 1/4 inches.

The eighteen speeds available for the boring spindle range from 45 to 2000 R.P.M. Six feeds in either direction range from 0.0008 to 0.0080 inch per spindle revolution. The machine has a maximum drilling capacity of 1 5/8 inches, and a maximum boring capacity of 9 inches. It is equipped with four motors, a 3-H.P. motor being used for the main drive. The machine weighs 7000 pounds, and measures 75 by 71 by 83 inches. 46

Bristol Stainless-Steel Socket-Screws

The Bristol Co., Mill Supply Division, Waterbury, Conn., has announced the addition of stainless-steel set-screws and cap-screws to its line of socket-screw products. The new screws are made of 18-8 type stainless steel, are non-magnetic, and are not heat-treated. The set-screws are

Bench welding equipment recently brought out by the Raytheon Mfg. Co.



Jig-boring machine introduced by the Hauser Machine Tool Corporation

To obtain additional information on equipment described here, use Inquiry Card on page 233.

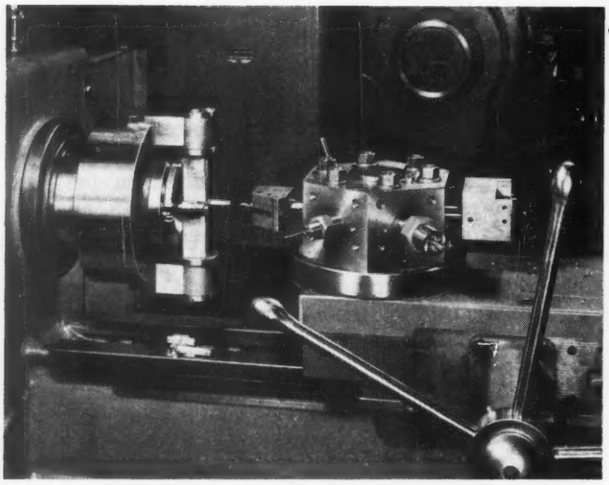


Fig. 1. Warner & Swasey "Electro-Cycle" machine equipped with new air-operated indexing chuck

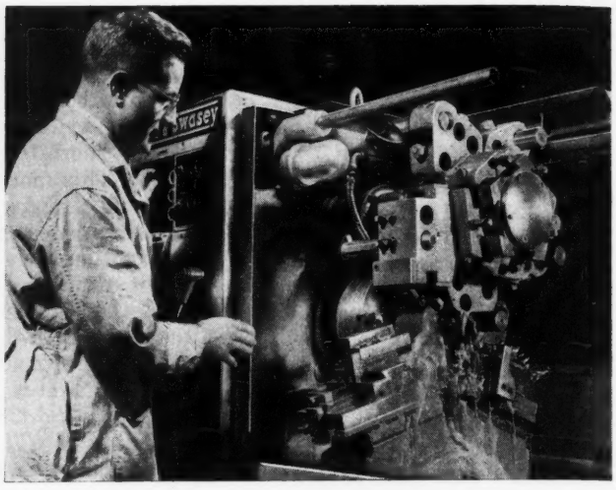


Fig. 2. Warner & Swasey single-spindle automatic provided with new threading equipment

made in diameters from No. 4 wire size to 3/4 inch, and the capscrews in diameters ranging from No. 4 wire size to 5/8 inch. Available in lengths of from 1/4 inch to 3 1/2 inches. 47

Raybestos-Manhattan Dynamometer for Pre-Testing Brake Linings

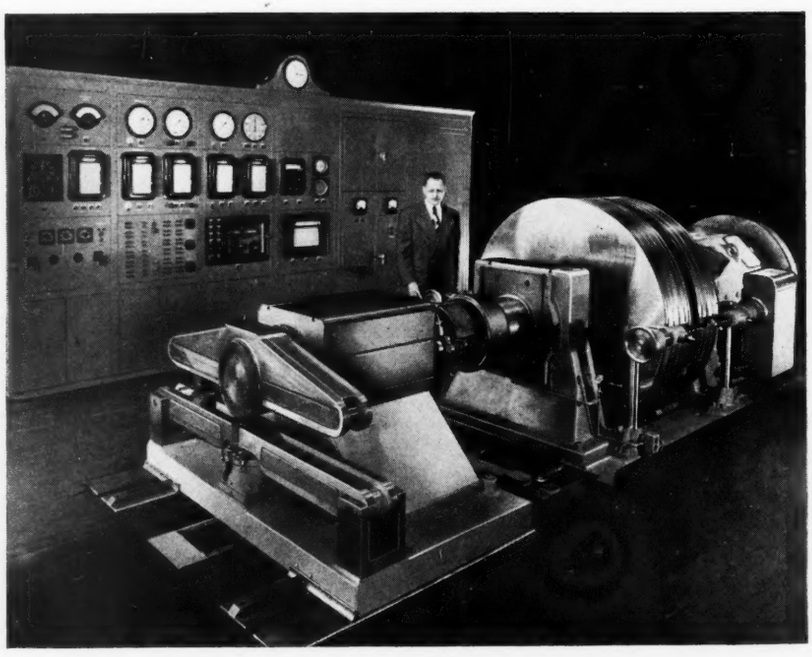
A new inertia type, heavy-duty dynamometer designed by Raybestos-Manhattan, Inc., and built by William R. Thropp & Sons Co., Trenton, N. J., has been installed in the Passaic, N. J., plant of Raybestos-Manhattan, Inc. This machine is said to be the largest of its type ever built. It will test materials used in stopping all types of automotive vehicles, railroad trains, etc. The equipment is especially valuable because of its ability to handle all types of full-size brake assemblies.

When fully loaded, the dynamometer can simulate the rear-axle brake of a truck with a gross load of 60 tons on three axles, road speeds in excess of 200 miles per hour, as well as speeds in the creeping range. All kinds of brakes including air, hydraulic, vacuum, electrical, and mechanical types can be tested on this machine. Railroad brakes, for instance, can be tested under wheel loads up to 40,000 pounds, the equivalent of a standard car weighing 160 tons. The instruments record all types of tests, including speeds, stopping rates, wear, and temperature. Special instruments are also provided for testing water-cooled brakes..... 48

New Equipment for Warner & Swasey "Electro-Cycle" and Single-Spindle Automatic Machines

A new 10-inch, 2-jaw, air-operated indexing chuck for their "Electro-Cycle" machines is a recent development of the Warner & Swasey Co., Cleveland, Ohio. This air-operated indexing chuck, shown in Fig. 1, is actuated by a floor type air valve. The chuck jaws are indexed on an axis parallel with the chuck face through each of four 90-degree positions while the spindle is turning. Thus, cutting operations performed by tools on each face of the hexagonal turret can be completed on all four limbs of a pipe cross, for example, at one setting of the turret. This greatly reduces the number of turret indexing movements.

The new indexing chucks are designed for use with Warner & Swasey Electro-Cycle lathes, still further contributing to the reduction in machine handling time effected by the electro-cycle electronic control system. The indexing chuck design is based on a standard air chuck body and closing mechanism, using special master jaws which are indexed through air power drawn from the stationary air cylinder.



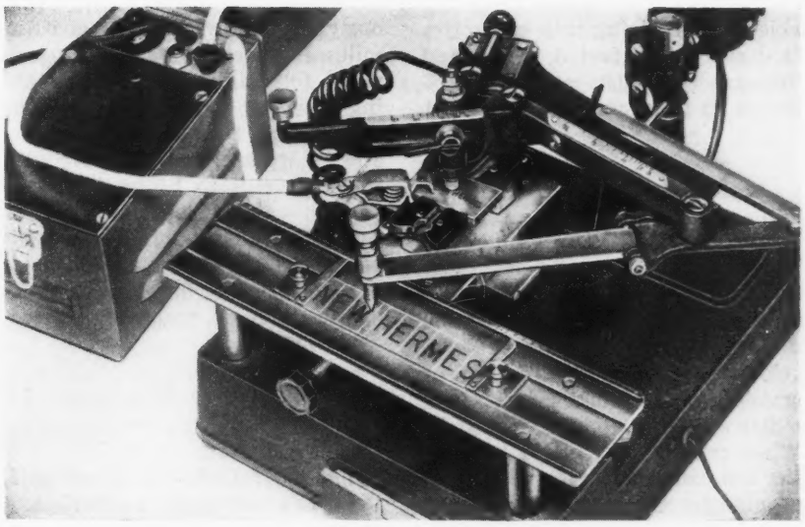
Raybestos-Manhattan dynamometer for testing brakes and brake linings

To obtain additional information on equipment described here, use Inquiry Card on page 233.

Two new optional arrangements of threading equipment have been developed by Warner & Swasey for their 1-AC single-spindle automatic illustrated in Fig. 2. The standard machine is normally equipped to cut right-hand threads of from 12 to 32 pitch with collapsible taps or self-opening dieheads. One new arrangement has a 10-H.P. open-frame, intermediate slip, reversing type main drive motor so that solid taps or dieheads can be used, as well as the self-opening types. This involves no mechanical change in the machine and permits maintaining tap torque in proportion to the motor capacity and spindle speed.

A fixed trip on the selector drum actuates a limit switch ordinarily used to engage a late cross-slide, but which in the tapping cycle is used instead to reverse the motor. When the motor reverses, the tap feeds out of the work at the correct rate and the machine automatically engages the rapid traverse reverse drive. Feeds of from 0.002 to 0.083 inch are obtained by means of change-gears.

The second arrangement combines the use of a reversing motor with a new feed and threading transmission incorporating two additional planetary shafts, so that a wider range of either right- or left-hand threads can be cut. Leads of 0.1666 to 0.0132 inch are available for left-hand threads. The right-hand range is from 0.1430 to 0.0312 inch. 49

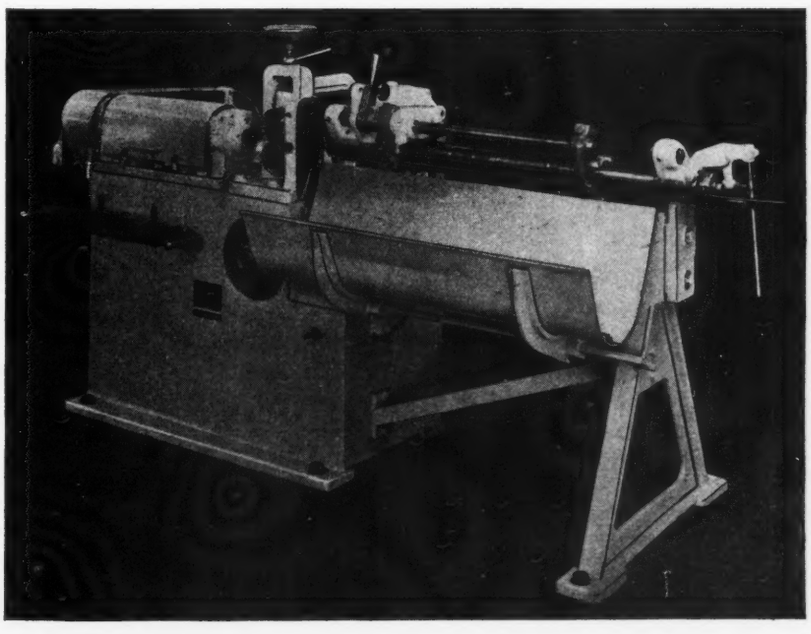


Portable tracer-guided etching equipment brought out by New Hermes, Inc.

Portable Tracer-Guided Etching Equipment

Portable tracer-guided etching equipment has been placed on the market by New Hermes, Inc., New York City. The new "Engravograph" is for use in marking on hardened steel and other metals. The electric marking method employed adapts it especially for extremely hard surfaces which cannot be engraved or stamped. This machine is said to be faster, more economical, and easier to control than acid etching equipment. No surface preparation, acid handling, or cleaning operations are required.

The machine can be operated by an unskilled person, since it uses a simple tracer control principle. The depth of the etching is controlled by an adjustable heat regulator. The unit is especially adapted for identification marking of tools, fixtures, etc. Only a minute is required to convert the machine from an electric etcher to a pantograph engraving machine for metals and plastics. The adjustable tracing arm provides for marking fifteen different sizes from a single master templet.....50



Wire-straightening machine recently announced by American Pullmax Co., Inc.

Pullmax Wire-Straightening Machine

A wire-straightening machine designed to operate on the rotary principle has recently been announced by the American Pullmax Co., Inc., Chicago, Ill. This machine has a capacity for straightening wire from 3/32 to 9/32 inch in diameter, and is entirely automatic, the wire being fed from a reel into the rotating straightening dies. The dies subject the wire to repeated bending, which removes internal stresses. The wire is fed by a pair of transport rollers onto a guide bar where it makes contact with a stop that actuates the cutting mechanism. At the moment of cutting, the feed motion is disconnected, so that the transport rollers will not slide against the stationary wire.

The rate of feed varies from 56 to 181 feet per minute. The machine will straighten and cut wire to any desired length up to 19 feet 6 inches. Various models are avail-

To obtain additional information on equipment described here, use Inquiry Card on page 233.

able with receiving tray capacities that start at 3 feet 3 inches and increase in multiples of 3 feet 3 inches to maximum length.....51

Deckel Universal Copy-Milling Machine

The Cosa Corporation, New York City, is introducing in this country a new Model KF1 Deckel universal copy-milling machine developed for the manufacture of small- and medium-sized dies and molds weighing up to 1100 pounds. When copy-milling at a 1 to 1 ratio, the pantograph serves only as a guide for the tracing stylus and cutter-head spindle. The parallel guiding device moves longitudinally, transversely, and vertically, and its weight is counterbalanced by an adjustable spring. Cutter-spindle speeds are stepless, and range from 300 to 9500 R.P.M.

Among the attachments available for this machine is an optical contacting device to indicate when the stylus touches the master. This is used only during rough-milling operations when the cutter-spindle is locked and the tables are coupled and moved simultaneously by handwheels. A circular milling attachment is also provided for milling radii and making concave and convex patterns of circular forms. A reduction and enlargement attachment with ratios from 1 to 1.5 up to 1 to 7 and an adjustable clamping arm for fixing cutter-spindle in various positions is also available.

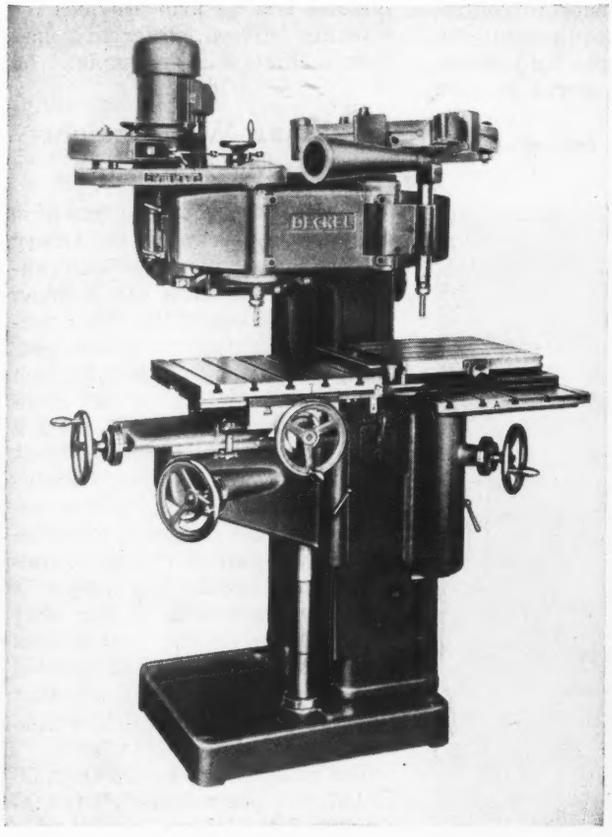
Rough- and finish-milling in longitudinal or transverse directions is facilitated by a line milling device. The circular table is 15 inches in diameter, and has a worm-gear drive with 360 divisions and an indexing plate with twenty-four notches. Milling cutters or single-lip cutters with 1/2 inch maximum diameters and stylus equipment can be supplied.

The machine is 47 inches long by 59 inches wide by 73 inches high, and weighs 2550 pounds. 52

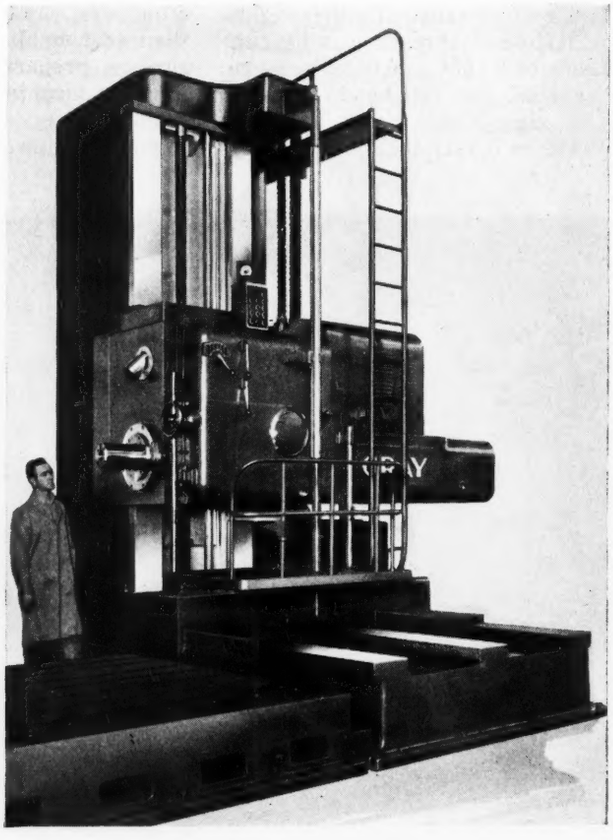
Gray Horizontal Boring, Drilling, and Milling Machines

The G. A. Gray Co., Cincinnati, Ohio, has announced a new 7- and 8-inch floor type horizontal boring, drilling, and milling machine. These machines have 50- to 100-H.P. spindle motors, and have been designed to utilize heavy-duty carbide milling cutters at maximum capacities. Precision boring and drilling operations are facilitated by the provision of twenty-four spindle speeds ranging in geometric progression up to 600 R.P.M. on the main spindle. Continuous bar feed and traverse movements ranging up to 84 inches are available.

Simplicity and convenience of control are made possible by using two motors to permit independent feeding of the head and column. Full pendent station control provides for automatic power clutch shifting and hydraulic clamping. Spindle speeds can be quickly and easily changed with the "Insto-Shift" device. Non-metallic ways insure prolonged accuracy of the main guide surfaces of the runway and column. The Gray electric "Woodpecker" permits quick power positioning of the multi-ton head and column to an accuracy of 0.00025 inch. 53



Deckel universal copy-milling machine introduced by the Cosa Corporation



Horizontal boring, drilling, and milling machine built by the G. A. Gray Co.

To obtain additional information on equipment described here, use Inquiry Card on page 233.

"ACA" motor with pre-set speed device brought out by General Electric Co.

G-E Motor with Pre-Set Speed Device

The "ACA" adjustable-speed motor made by the Small and Medium Motor Divisions of the General Electric Co., Schenectady, N. Y., is now available with a mechanical follow-up control for achieving a fixed pre-set speed without the use of expensive control equipment. The new device can be set manually for a predetermined speed by means of a knob located either directly on the "ACA" motor or at the end of a flexible cable 10 or 15 feet away. The speed adjustment can be made while the motor is stopped or while it is running.

In operation, the mechanism actuates a pilot motor which drives the brushes to a position corresponding to the setting of the speed adjustment knob. A stop or automatic slow-down returns the brushes to the lowest speed position without disturbing the original setting. When the motor is started again, the brushes return to the pre-selected speed without any attention from the operator. Accelerating time is dependent upon the pilot motor speed. Applications include offset printing presses, small rolling mills, ball mills, punch presses, fan drives, can-sealing machines, planer feed-roll drives, and conveyor drives. 54

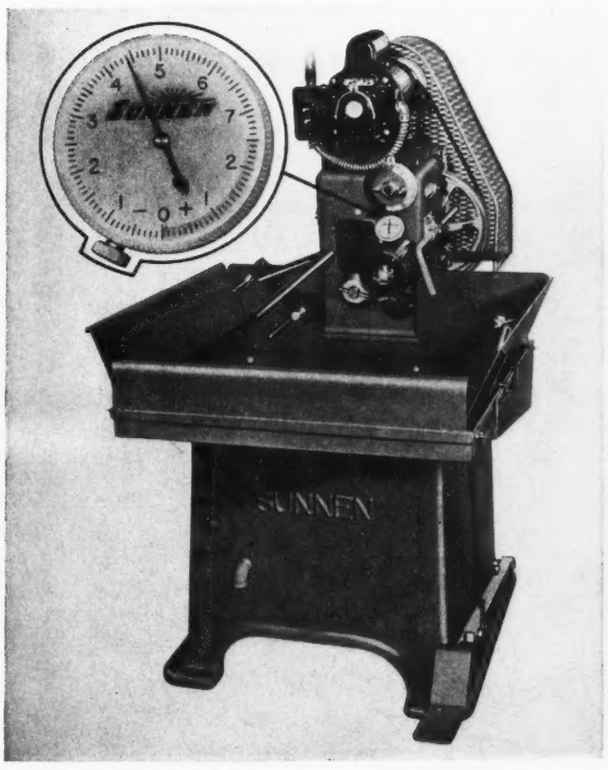
Sunnen Size-Control Gage

A size-control gage designed to reduce gaging time has been developed by the Sunnen Products Co., St. Louis, Mo., for use on honing machines made by the company. It enables the operator to see or read the hole size at any time while the honing machine is in operation. It facilitates holding close tolerances and also helps eliminate rejects. Stock removal and the cutting action of the stone are also indicated. With this gage, unskilled operators can do good work without requiring extensive training.

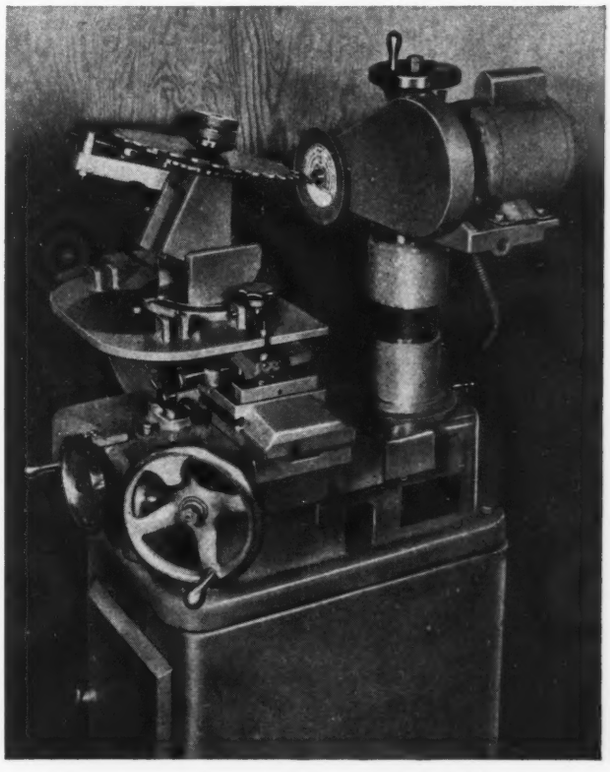
The size-control gage is really a precision indicator gage actuated by the stone feed-up dial on the honing machine. As the hole is honed larger the stone feeds up automatically. The gage shows how much the stone feeds upward, and thus indicates when the hole is close to the finish size. 55

Hanchett Grinder Designed for Sharpening Circular Saws

Sharpening of carbide-tipped circular saws, knives, and cutterheads can be accomplished on a new universal grinder designed by the Hanchett Mfg. Co., Big Rapids, Mich. The circular saw fixture of this CT-18 grinder permits sharpening both metal and wood saws of the inserted-tooth, segmental, solid-carbide tip, beveled, and straight tooth types, as well as standard saw blades. It has a capacity for sharpening saw blades ranging from 8 to 24 inches in diameter.



Sunnen honing machine equipped with new size-control gage



Hanchett universal grinder for sharpening circular saws

Thick or thin knives 12 inches long by 4 inches wide can be sharpened to a fine finish with the revolving knife bar fixture which is mounted on heavy journals. Another fixture is available for sharpening side-head cutters. A headstock and tailstock unit can be furnished for use in sharpening molder top heads. The magnetic chuck serves as a holding fixture for finish-grinding thin strip steel stock.

The wheel-head column can be revolved a full 360 degrees for positioning at any angle, and will handle wheels of the straight, saucer, cup, cylinder, or flaring cup types. The alloy steel spindle has spring-loaded ball bearings. This grinder is available in either a bench or a floor type. 56

Cross Special Machine for Drilling and Boring Aircraft Cylinder Heads

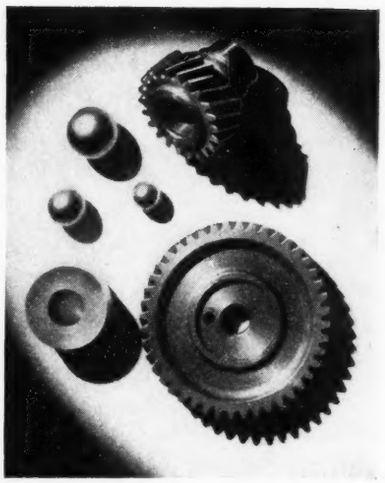
The Cross Company, Detroit, Mich., has just built a special "Transfer-matic" machine intended for production drilling and boring operations on aircraft cylinder heads. This automatic transfer machine has four cutting stations and a fifth station for loading.

The first operation consists of drilling the valve guide holes and rough-forming the valve pockets and spring compartments. In the second operation, the valve guide holes, insert seats, and spring seats are finish-bored. The pallet type work-holding fixtures have interchangeable adapters for holding four different parts. Stub tools are used for drilling and forming, eliminating the necessity for tool guide bushings. The coolant is fed through the spindles and tools to the cutting points.

The automatic work-handling features are said to make it possible for one operator to complete eighty pieces per hour. Other features include hydraulic feed, rapid traverse, and the use of standard Cross sub-assemblies to facilitate maintenance, reduce "down time," and provide flexibility for part design changes. 57

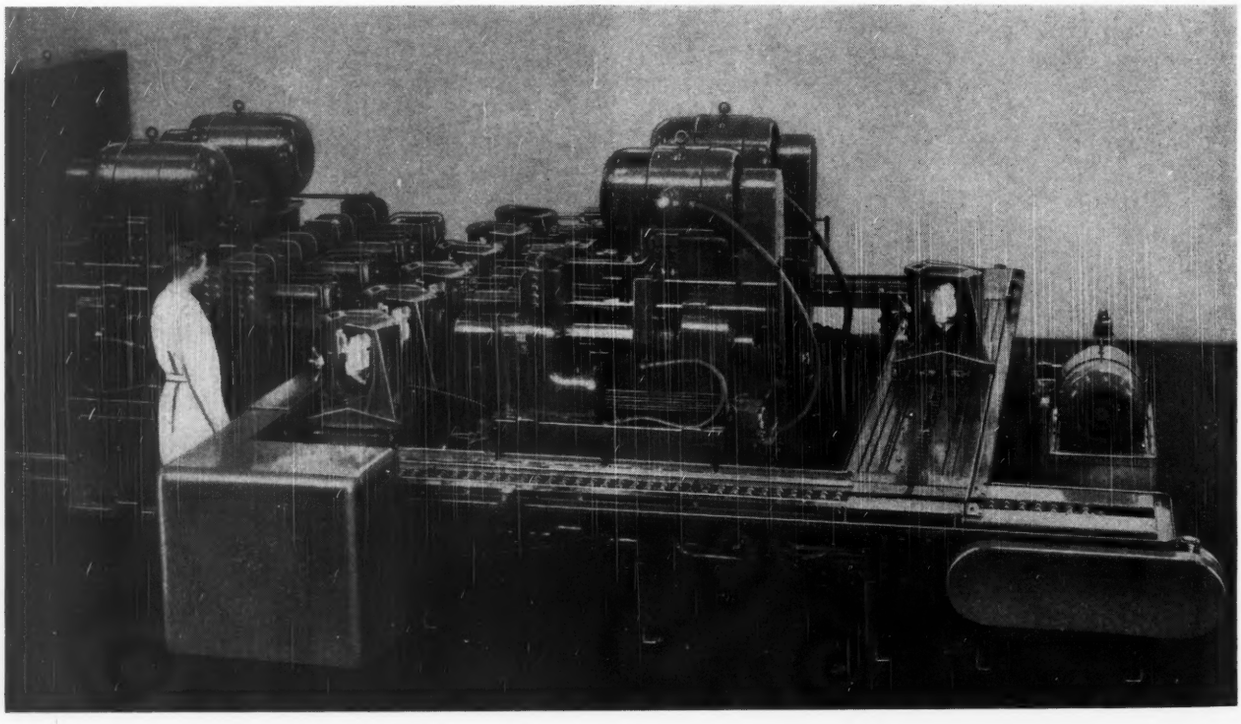
Carbide Balls for Sizing Holes

Tungsten-carbide balls for sizing holes have been placed on the market by Industrial Tectonics, Inc., Ann Arbor, Mich. These balls are available in sizes from 1/32 inch to 3 inches in diameter with size tolerances of plus or minus 0.000025 inch, roundness tolerances of 0.000010 inch, and surface finishes of 1 micro-inch. Holes processed with these balls have an excellent surface finish and are held to size within exceptionally close limits.



Tungsten-carbide balls available from Industrial Tectonics, Inc., for sizing holes in gears and similar parts

Automatic production lay-outs employing dial or hopper feeds for the parts and a recirculating set-up for the tungsten balls make possible economical ball burnishing for large-volume production, especially since replacement costs for the carbide balls is practically negligible. The sizes of hole diam-



Special machine for drilling and boring aircraft cylinder heads, built by The Cross Company

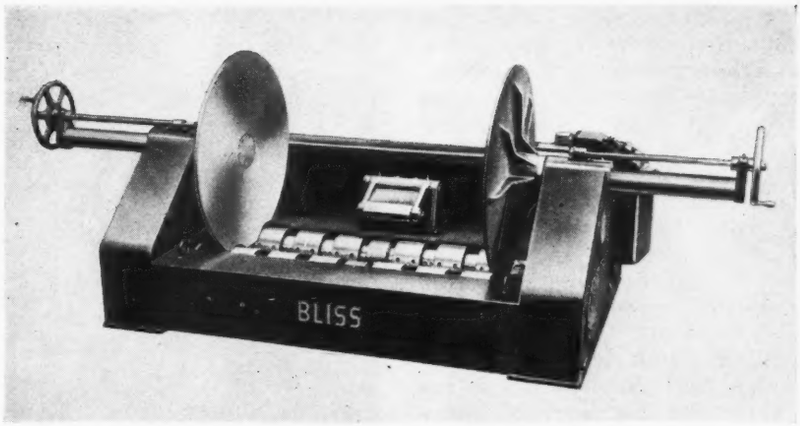
To obtain additional information on equipment described here, use Inquiry Card on page 233.

eters can be readily controlled within plus or minus 0.0003 inch. Even greater accuracy is possible in some cases, depending upon the uniformity of hardness, surface condition, and size of the unfinished hole. Holes in casehardened parts can be sized successfully in some instances. 58

New Line of Coil Cradles

A new line of coil cradles with capacities up to 15 tons has been announced by the E. W. Bliss Co., Toledo, Ohio. The new cradles, available in several sizes, can be equipped with special high-friction cast-iron or Formica roll surfaces to minimize slippage on out-of-round coils. The rolls are mechanically driven through an adjustable speed drive. The main gears are fully enclosed and splash lubricated. The rotating side guide plates are mounted on roller bearings and are adjusted manually. Provision is made for motor adjustment of these guide plates when desired.

A feature of the design is the low entrance on the side of the cradle, which allows the coils to be rolled into the cradle by gravity from an inclined ramp. A number of coils can be loaded on the ramp at a time and a mechanism can be fitted to the equipment for releasing a single coil as required.



Coil cradle of new line brought out by the E. W. Bliss Co.

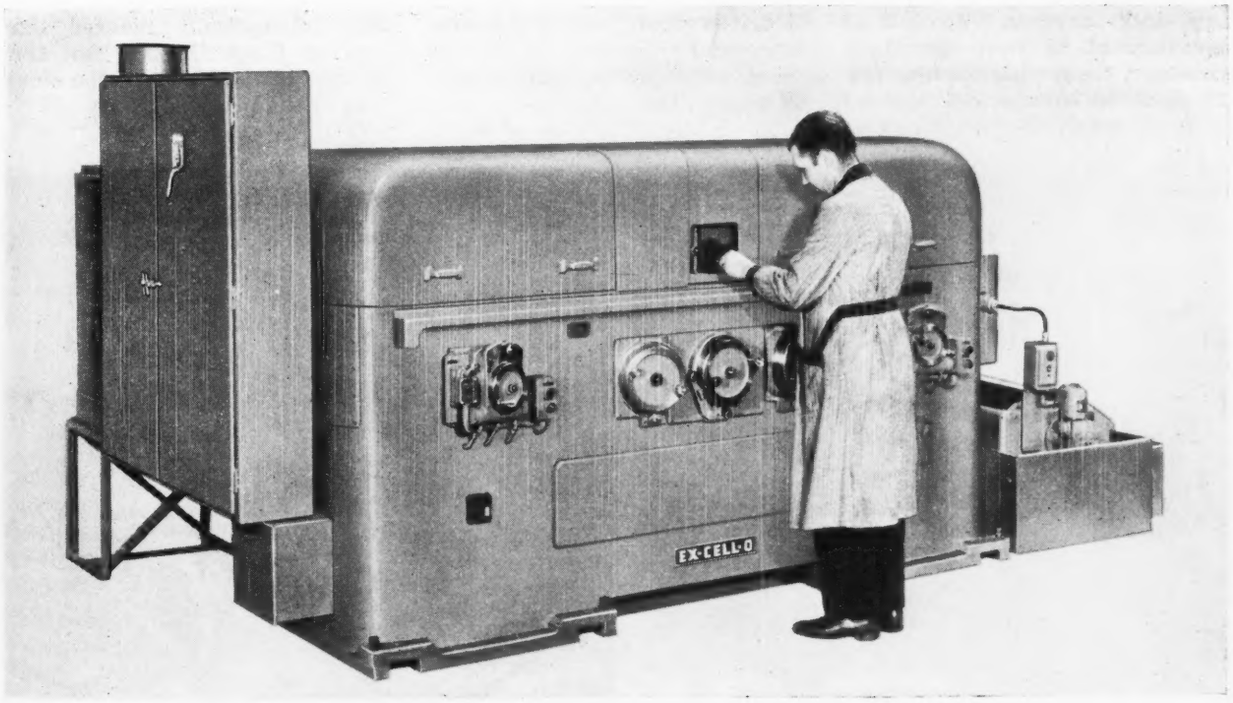
The cradle is equipped with a hydraulically cushioned coil catcher to prevent jarring the coils out of round, to absorb the impact, and ease the coil into position when ramp loading is employed.

The cradle illustrated has a capacity of 10 tons, will handle stock 72 inches wide, is driven by a 10-H.P. motor, and has a maximum feeding speed of 100 feet per minute. 59

Ex-Cell-O Machine Developed for Grinding Jet-Engine Blades

The Ex-Cell-O Corporation, Detroit, Mich., has developed a precision two-wheel form grinder for the high-production processing of jet-engine blades. The two 24-inch diamond-dressed grinding wheels simultaneously finish both sides of the root form of the blade. Dovetail or "pine-tree" forms of various sizes can also be ground. Simple controls and automatic cam functioning make it possible for unskilled operators to handle this class of precision work on the new machine.

The blades are held in fixtures that accommodate one or two blades, depending on the size, and that are removable from the machine. The operator simply places

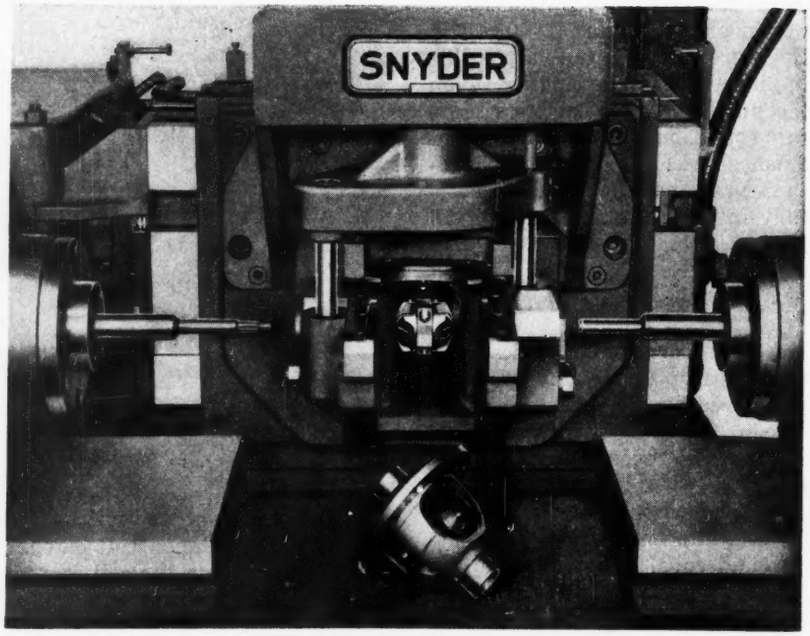


Machine developed by the Ex-Cell-O Corporation for grinding jet-engine blades

To obtain additional information on equipment described here, use Inquiry Card on page 233.

the loaded fixture on the machine slide, presses the "clamp" button, and then presses the "start cycle" button. While one blade is being ground, a finished blade is removed from another fixture and replaced with a new piece, and the finished part checked.

The automatic cycle causes the part to move to the grinding wheels and reciprocate between them for a predetermined number of strokes at a given speed. At the end of each stroke or alternate strokes, the grinding wheels are fed toward the work a predetermined amount until the finish size is reached. The machine slide then returns to the forward position, the fixture is unclamped, and the feed mechanism reset for the next cycle. ----60



High-production machine of special design for operations on a differential gear-case, built by Snyder Tool & Engineering Co.

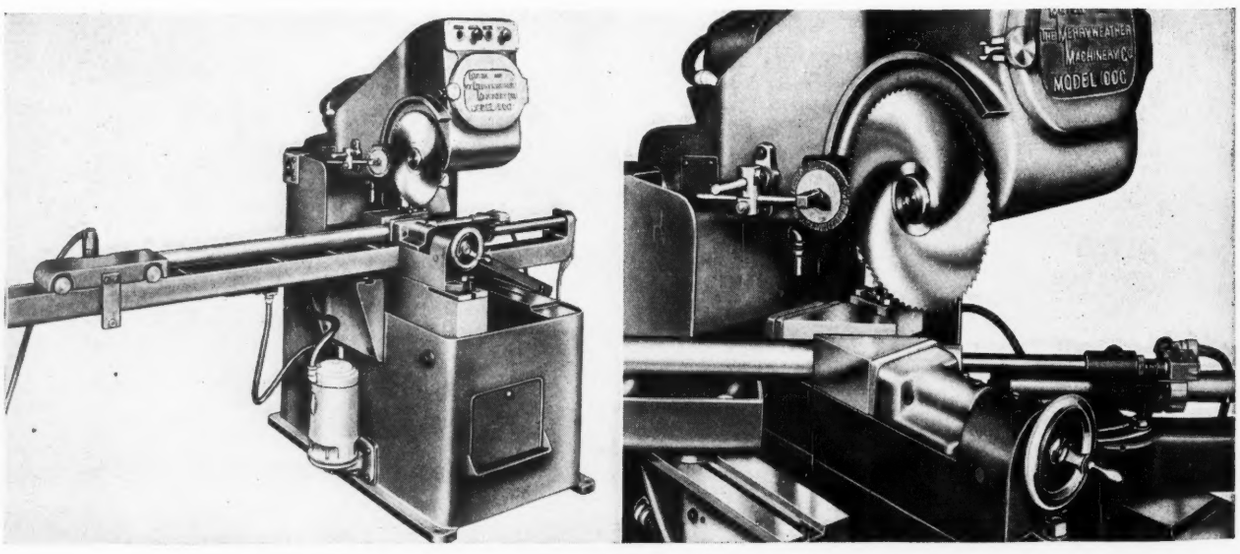
Special Machine for Milling Gear Seats in a Differential Gear-Case

A special high-production machine for rough- or finish-milling two spherical gear seats inside a differential gear-case has been built by the Snyder Tool & Engineering Co., Detroit, Mich. When the work is located in the fixture, it is clamped by hydraulic power and automatically indexed into position for milling the seat first in one side and then in the other side of the gear-case.

Motch & Merryweather Circular Sawing Machine

Fast and accurate square or angular cutting off of ferrous or nonferrous materials in sizes up to 3 inches is possible on the new Model No. 00-G circular sawing machine manufactured by the Motch & Merryweather Machinery Co., Cleveland, Ohio. Cutting-off operations at angles up to 45 degrees can be performed on this machine by employing clamping jaws set as shown in the view at the right in the illustration and feeding the material by moving the supporting stock conveyor. When it is inconvenient to move the stock conveyor, the sawing machine can be mounted on a swivel base so that it can be pivoted to the desired cut-off angle. Either round or square stock can be fed into the machine manually or by an automatically operated air-powered stock-feeder.

Special gaging and holding fixtures for odd-shaped extruded and intricate parts can be easily adapted to the machine. The gravity feed of the one-piece saw head is controlled by means of a hydraulic flow control valve. The saw blade is driven directly by the geared saw head. Changes in sawing speeds are made by means of pick-off gears. ----61



Motch & Merryweather circular sawing machine with provision for making square or angular cuts

To obtain additional information on equipment described here, use Inquiry Card on page 233.

The carbide cutter is held in a yoke on a stationary bracket, and the part is loaded over the cutter. The driving arbors engage the cutters automatically. The tool speed is 80 feet a minute; feed, 3.5 inches a minute; and stroke 4 inches. The spindle is driven by a 3-H.P. motor through belts and helical gears in the machine head. Tools are quickly changed by removing two screws in the carrier horn. Coolant is supplied from a separately mounted 42-gallon tank.

The machine requires a floor space of 71 1/2 by 109 inches, and is 62 1/2 inches high. The fully automatic work cycle is 40 seconds. Although considered a special type, this machine is built from standard components, and can be readily and economically adapted for processing a wide range of similar parts. 62

Ingersoll-Rand "Impactools" for Nut-Running

The Ingersoll-Rand Co., New York, N. Y., has announced two new air-operated "Impactools," the Size 504 for running nuts up to the 3/8-inch bolt size and the Size 510 for running nuts up to the 3/4-inch bolt size. Both tools are of the pistol grip type and are specially designed and balanced for easy handling. The large reverse caps are deeply grooved to permit quick reversal of the tools even when the operator's hands are greasy.

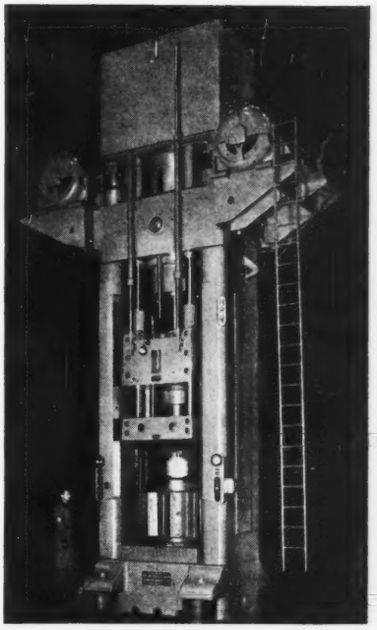
Muffling is employed on the tools to lower operator fatigue and increase safety. Both tools have a high run-down speed before the impacting action begins. Small, powerful, vane type air motors provide the speed and power required to handle difficult nut-running jobs. The Size 510 impact tool is the most powerful of this line built for one-hand operation. It weighs 11 1/4 pounds and is 10 7/8 inches long. 63

Traverse Mounting for "Beta Ray" Gage

Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn., has announced that a traverse mounting is now available for its "Beta Ray" continuous mill gage, which makes it possible to scan and gage the full width of continuous strip material. The new mounting is intended for use in controlling the edge-to-edge uniformity of sheet rubber, plastic, paper, asbestos, cloth, metal, and other materials. The rate of scanning is from 18 to 30 inches per minute, and the operation is completely automatic.

When the Beta Ray gaging heads reach the edge of the strip material, they automatically reverse and scan in the opposite direction.

Recorders are available for use with the gage, and process control or alarm signal circuits may be incorporated in the installation if desired. The Beta Ray gage uses radioactive isotopes from the atomic pile for measuring thickness deviations in continuous strip material. As it is non-contacting, it readily gages substances which are wet, sticky, highly polished, or soft. 64

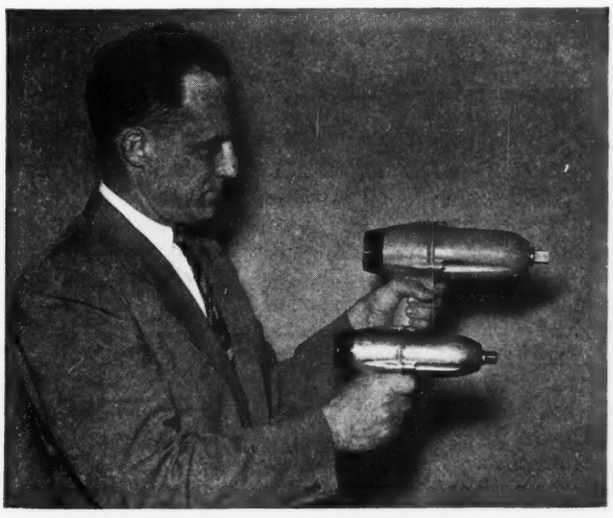


"Fastraverse" sheet-metal drawing press built by the Hydraulic Press Mfg. Co.

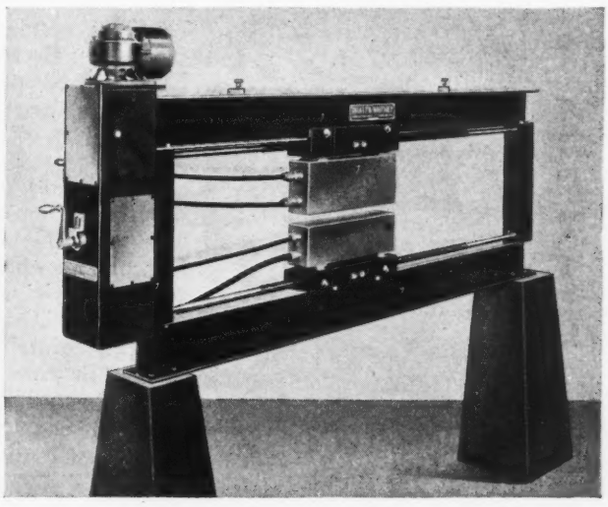
"Fastraverse" Sheet-Metal Drawing Press

Several new 750-500 ton "Fastraverse" sheet-metal drawing presses designed and built by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, have been installed in large sheet-metal plants. These hydraulic presses are being used for deep-drawing and forming and blanking operations on both heavy and light gage stock.

For heavy-duty work, the press is equipped with a 250-ton blankholder and a 200-ton hydraulic die cushion having a 36-inch stroke. The die cushion platen is 47 by



Nut-running air-operated impact tools placed on the market by the Ingersoll-Rand Co.



Pratt & Whitney "Beta Ray" gage for continuous edge-to-edge scanning of strip material

To obtain additional information on equipment described here, use Inquiry Card on page 233.

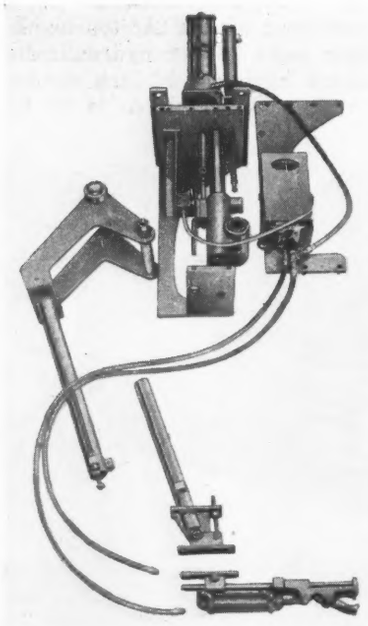
47 inches, and will draw and lift out a part 36 inches deep.

Some of the outstanding design features of these presses are adjustable blank-holder pressure at each of the four corners of the slide; rapid advance to work, with automatic slow-down as the die contacts the work; complete automatic press cycle, handled by push-button controls; and automatic press reversal. 65

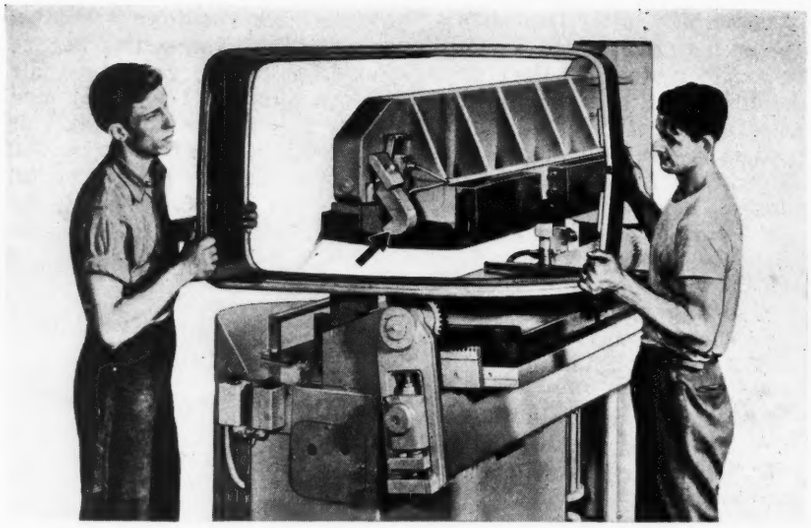
"Iron Hand" for Automatic Unloading of Stamping Presses

The "Iron Hand" is built by the Sahlin Engineering Co., Birmingham, Mich., to automatically unload stamping presses. It is now made in larger models having 20- and 24-inch strokes to facilitate handling and turning over large stampings. The longer stroke and longer reach into the die provided by a new jaw assembly make it possible to handle a greater variety of stampings.

The new assembly is lighter and has 30 per cent fewer moving parts, yet the simpler construction provides greater sturdiness. The cycle time has been changed to provide operating speeds ranging from 12 to 20 strokes per minute. A safety limit switch stops the press midway in its down stroke if the jaws do not retract properly to the rest position due to failure in the air line. An improved cylinder arrangement simplifies adjustment and maintenance. A new type chisel jaw blade, not shown, eliminates the need for using lifters in the die in most cases, since the jaw itself chisels the stamping out of the die and lifts it vertically over the gage pins. 66



Units of "Iron Hand" developed by Sahlin Engineering Co. for unloading stampings from presses



Single-wing tangent bender with open throat designed to facilitate work removal, built by the Cyril Bath Co.

Open-Throat Single-Wing Tangent Bender

A variety of styles of metal cabinets can be completely formed in one piece in a single cycle of operations on a new open-throat single-wing tangent bender designed by the Cyril Bath Co., Cleveland, Ohio. These machines are being used to turn out television set housings, refrigerator cases, and cases for electric ranges, space heaters, and other small appliances at rates up to 400 bends per hour. They will produce cabinets with either flat or crowned sides.

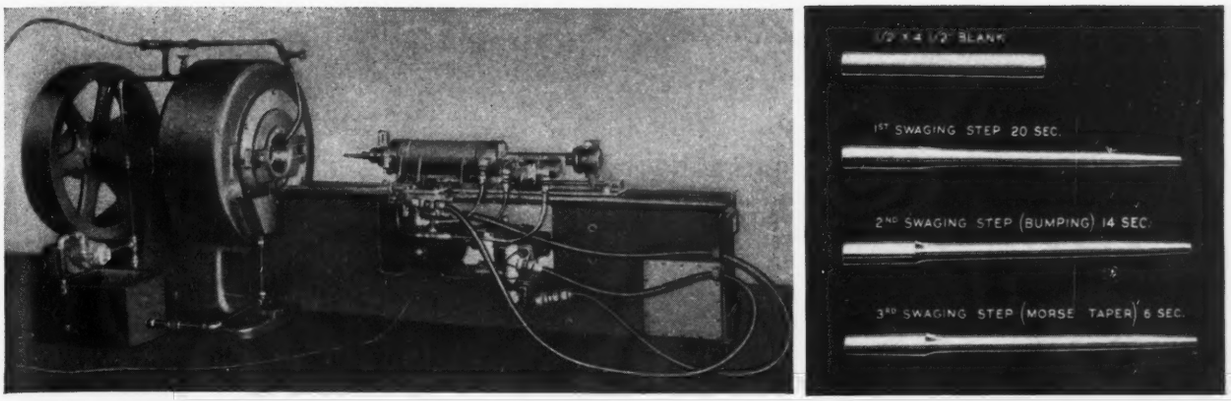
Die changes are said to be comparatively simple and inexpensive. The machine is readily adapted for making bends of different radii. Provision is made for easy unloading of the finished cabinets. A unique latching arrangement leaves the ram open at one end after the working stroke to provide ample clearance space for intermediate positioning of the work and for removal of the finished case.

In action, the ram of the new machine descends rapidly to within 1 inch of the bottom of the full stroke. At this point, latches at both ends of the ram—one of which is indicated by an arrow—engage lever arms on the bed and pull the ram down with a pressure of more than 17 tons. Flat metal sheets can be blanked, punched, or otherwise formed during this initial movement and then held stationary for the bending wing to move up and form the corner radius with flanges that are free from wrinkles. 67

Swaging Machine Equipped with Special Dies

The Fenn Mfg. Co., Hartford, Conn., has brought out a new swaging machine equipped with dies developed especially for the production of tapered spindles for textile machines. The spindle blanks are of tough 52100 type steel with an initial hardness of 90 Rockwell B. They are 1/2 inch in diameter, 4 1/2 inches in length, and are fed into the swaging machine hydraulically.

The spindles are swaged on this machine in three operations. One set of dies swages the blank to a diameter of 3/8 inch during the first operating cycle in twenty seconds, including loading, swaging, and unloading. A "bumping" operation follows, which is performed by a second set of dies in fourteen seconds. The final swaging operation produces the Morse taper on the shank end of the spindle and is accomplished in six seconds. Concentricity is main-



(Left) Swaging machine developed by the Fenn Mfg. Co. for producing textile machine spindles
(Right) Views showing blank and successive operations performed by machine shown at left

tained within 0.004 inch. The swaging operations produce a finished spindle 9 inches long from the 4 1/2-inch long blank.

Although developed to produce textile machine spindles, the new swaging machine can be adapted for handling a wide range of work in the metal-working field. 68

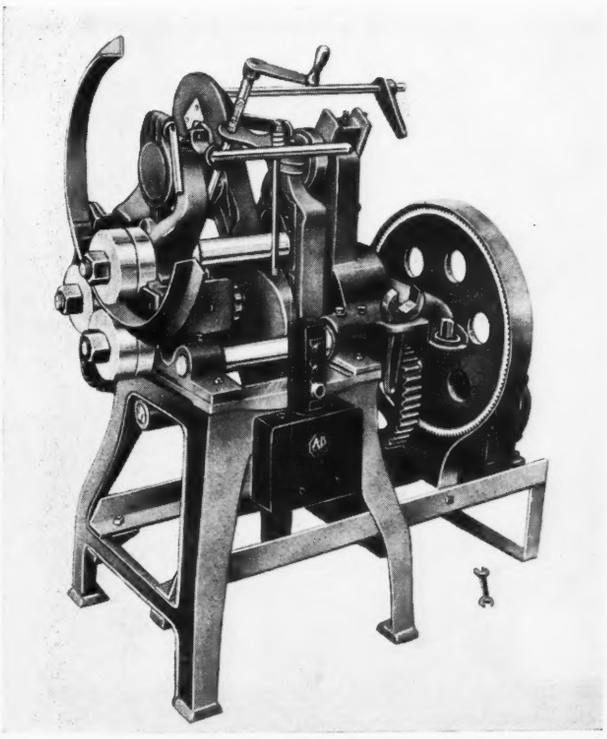
Excelsior Reversible Circular Bending Machine

Angles, flats, pipes, rounds, squares, tees, channels, and various other cross-sections can be rolled into complete or part circles on a new reversible circular bending machine of the roller type announced by the Excelsior Tool & Machine Co., East St. Louis, Ill. The finger-tip push-buttons shown on the front of the machine control forward, reverse, and inching movements and stopping of the rollers.

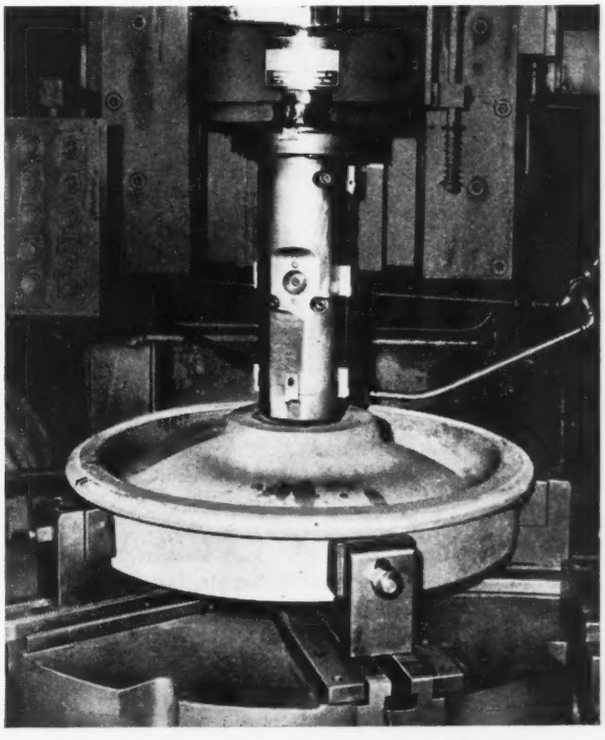
This machine has a capacity for circular bending 2- by 2- by 1/4-inch mild steel angles or the equivalent. A 5-H.P., 220- to 440-volt, three-phase, sixty-cycle motor drives the machine. The bending rolls are 6 7/8 inches in diameter by 1 7/8 inches wide, and have a 2 3/16-inch bore with a keyway. The machine requires a floor space of 38 by 60 inches, is 60 inches high, and weighs 2200 pounds. 69

Davis Car-Wheel Boring Tool with Solid Carbide Blades

Micrometer expansion car-wheel boring tools equipped with blades of solid tungsten carbide are being placed on the market by the Davis Boring Tool Division of Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. These new tools, developed to make possible increased wheel production



Circular bending machine with push-button control motor, brought out by Excelsior Tool & Machine Co.



Car-wheel boring machine equipped with a flange-mounted Davis boring tool having carbide blades

To obtain additional information on equipment described here, use Inquiry Card on page 233.

A "Multi-Dividend" Investment
for production milling of small parts

THIS modern, manufacturing-type milling machine is a glutton for work. It is highly efficient and adaptable to all types of small milling operations. It produces work of consistently-uniform accuracy and finish and operates at an extremely rapid, economical rate. In nearly every plant there are plenty of jobs to keep the Brown & Sharpe No. 000 busy . . . continuously . . . assuring multi-dividends from the investment, over a long period of time.

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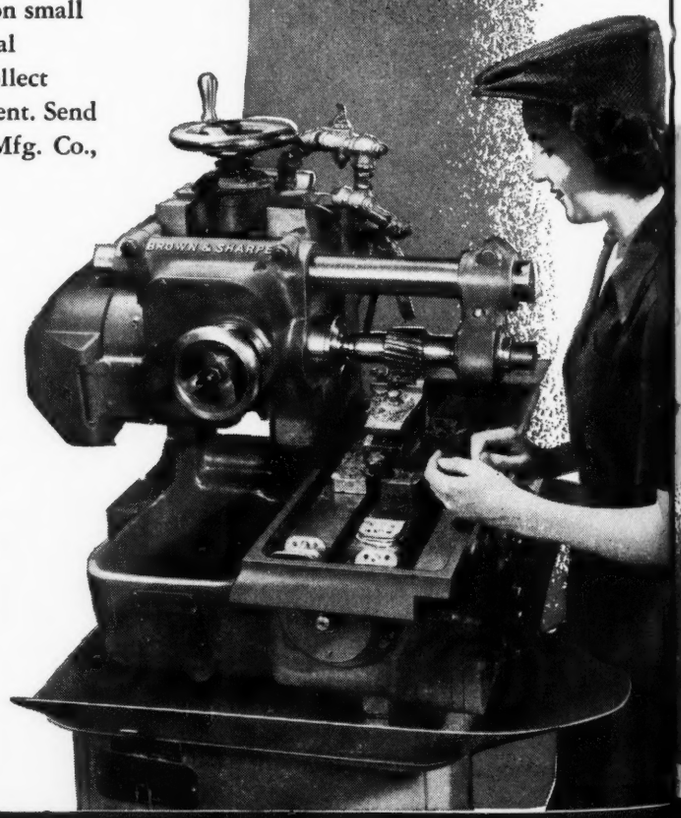
THE VERSATILE No. 000 PLAIN MILLING MACHINE



No. 000 DIVIDEND FEATURES

for consistent accuracy and finish

- 16 changes of spindle speed, 105 to 3540 R.P.M., suitable for milling a wide range of materials—extra high speed range available.
- 16 rates of feed from 9/16" to 24⅜" per minute—with full automatic operation.
- Direction of spindle rotation can be set by switch. With intermittent operation, spindle stops when table stops . . . to assure safety in loading.
- Table reversal accurate to .002" . . . particularly advantageous in making blind cuts.

for fast production rate

- Extremely rapid fast-travel movement.
- Work can be safely advanced at fast travel close to cutter.
- Wide range of feeds permits fast efficient milling on a variety of materials.
- Automatic cycle reduces operator fatigue and non-cutting time to minimum — often permits operator to load work with both hands.
- Simple, fast set-ups.

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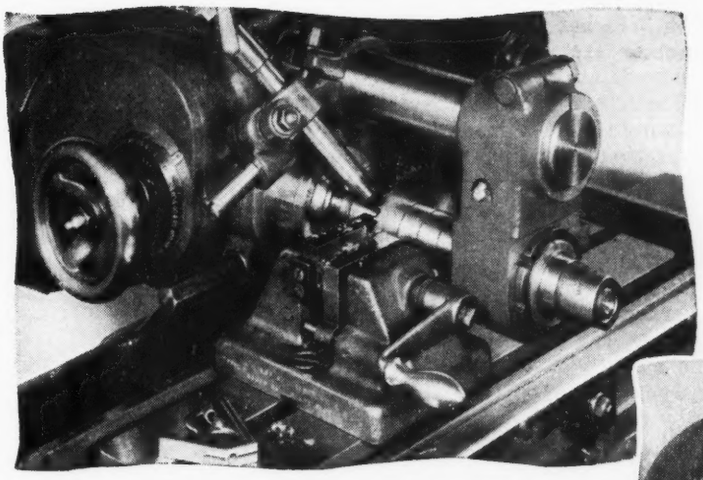
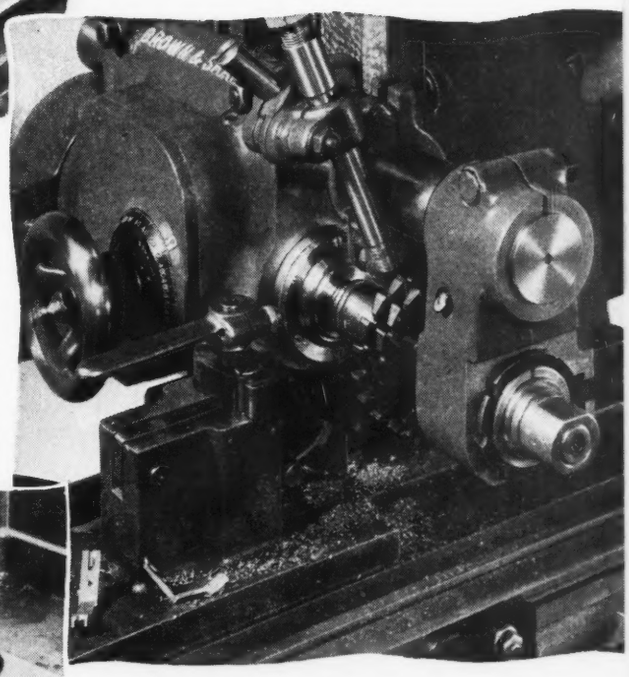


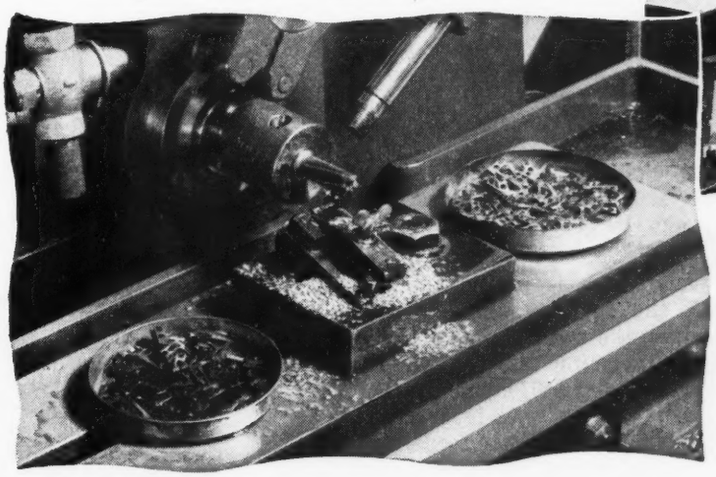
A Dividend of Accuracy ▲

Consistent accuracy of table reversal . . . to .002" . . . assures uniform depth of slot in this blind cut.

A Dividend of Speed ▼

Rapidity of table movement permits taking light, short cuts practically as fast as operator can load and unload fixture.





A Dividend of Versatility ▲

Broad range of spindle speeds permits efficient use of comparatively large cutters down to the smallest end mills.

SHARPE

B·S

in railroad car shops, are especially useful where continuous wheel output is required to meet rolling stock needs. They are adapted for boring both cast-iron and steel wheels. Four cutters are used in rough-boring, two in finish-boring, and a single cutter for chamfering.

The cutters can be easily adjusted to the required bore size within 0.001 inch by means of a graduated screw which operates an expanding wedge. Since a diameter adjustment of as much as 1 1/8 inches is possible, a wide range of bore sizes can be finished by a comparatively small number of tools. The largest size tool can be adjusted for boring holes up to 12 inches in diameter. 70

Starrett Micrometer Depth Gage and Dial Comparator

A new micrometer depth gage and a dial comparator are recently announced products of the L. S. Starrett Co., Athol, Mass. The micrometer depth gage, shown in Fig. 1, has blade type rods approximately 0.045 inch thick by 1/8 inch wide instead of the conventional round rod. The blade turns under friction so that it can be positioned at any angle relative to the base. When in actual use for depth measurements, the blade moves perpendicularly without turning. This outstanding feature permits measuring the depth of narrow shoulders without danger of the blade rolling off.

This gage, known as No. 449, is available in two sizes, with bases 2 1/2 or 4 inches long. The bases are hardened, ground, and lapped to insure long accurate life. The screw is accurately ground and provides a movement or adjustment of 1 inch. Both sizes can

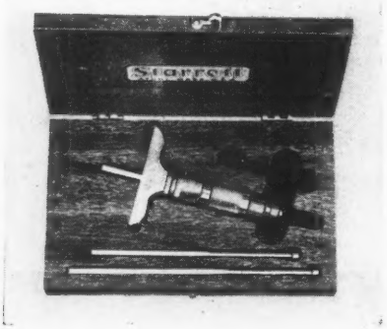


Fig. 1. New Starrett micrometer depth gage

be furnished for measuring from 0 to 3 inches by means of three rods, or from 0 to 6 inches by means of six rods.

The No. 653 dial comparator shown in Fig. 2 is designed for inspection operations and for use in tool-rooms and machine shops on a wide variety of applications. It has a rigidly ribbed base platen which is precision-ground to close limits. All types of work, as well as various V-blocks and special fixtures, can be accommodated on the base.

Operation of the dial indicator is by means of a convenient hand-

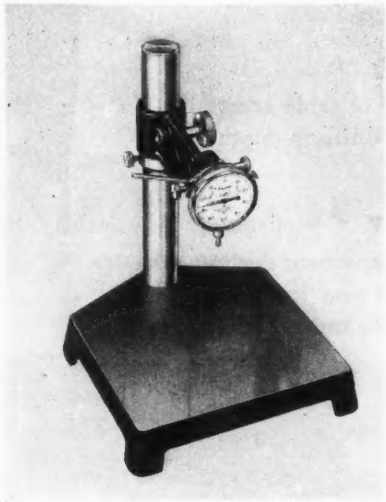


Fig. 2. Starrett dial comparator with vertical indicator adjustment

lever, which is pressed down to lift the spindle and released to contact the work. Left-hand operation permits easy handling of work with the right hand. If desired, however, the lever can be located for right-hand operation. Plus or minus variations from size in 0.001 inch steps can be read off instantly from the indicator. Readings are uniformly accurate because of predetermined spring contact pressure that is entirely independent of the operator's "feel."

The dial can be adjusted from 0 and then locked with the bezel clamp. The indicator regularly furnished is graduated to 0.001 inch and has a range of 0.250 inch. The maximum vertical capacity is 9 1/4 inches; maximum throat depth 5 inches; base platen size 9 by 9 5/8 inches; and indicator vertical adjustment 1 5/16 inches. The over-all height is 13 3/8 inches, and the weight approximately 16 pounds. 71

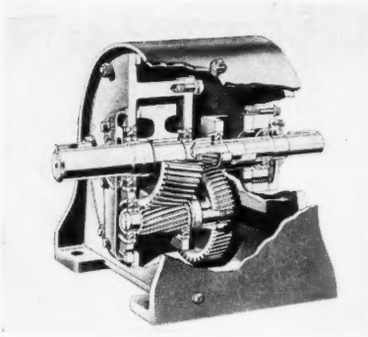


Fig. 1. Falk concentric shaft speed reducer

Falk Speed Reducers

A concentric speed reducer, known as Type C, and a horizontal or vertical right-angle speed reducer, designated Type CB, have been announced by the Falk Corporation, Milwaukee, Wis. These speed reducers, designed for a wide variety of power transmission requirements, are adaptable to electric motor drives, belt drives, gas engine drives, etc.

The concentric speed reducer, Fig. 1, has output speeds of from 1 to 1170 R.P.M. and input speeds up to 1750 R.P.M., and higher if necessary. The ratio range is from a minimum of 1.5 to 1 to a maximum of 970 to 1. The approximate power range is from 1 to 50 H.P.

The right-angle speed reducer shown in Fig. 2 is available with the output shaft in either the horizontal or vertical position. The range for output speeds is from 1 to 350 R.P.M., and for input speeds up to 1750 R.P.M. The mechanical efficiency is said to be from 96 to 98 1/2 per cent at full load, depending upon the number of gear trains used. The ratio range is from 5.7 to 1 up to 515 to 1, and the power range from 1 to 50 H.P. 72

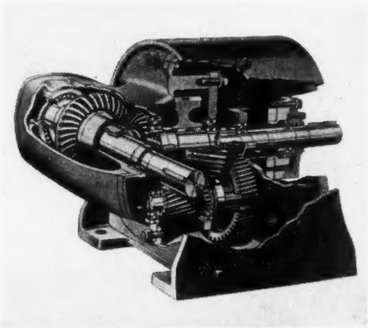
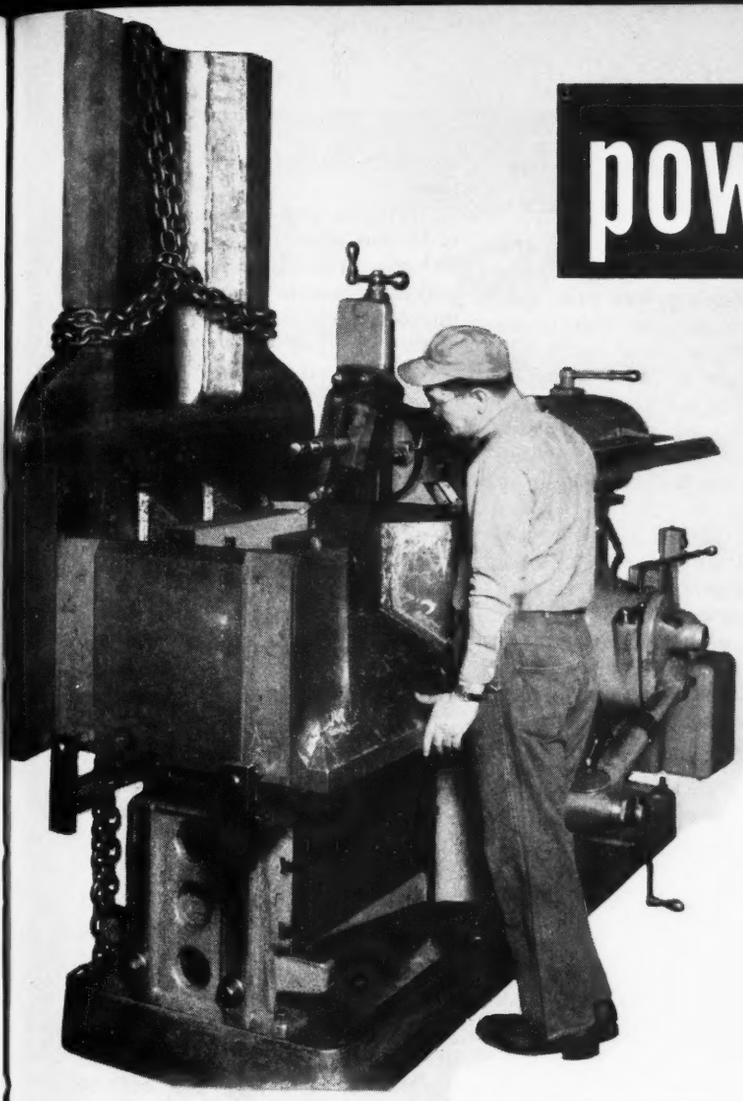


Fig. 2. Falk right-angle speed reducer

To obtain additional information on equipment described here, use Inquiry Card on page 233.

powerful!



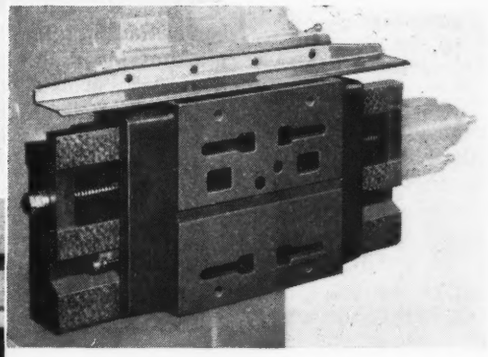
Jobs like this 5300# weldment are easy on a Cincinnati

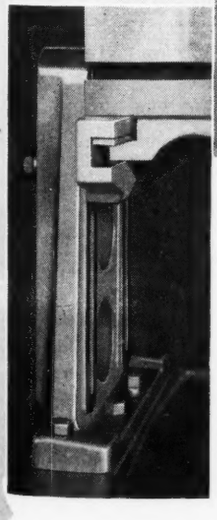
Cincinnati Shapers are powerful and dependable...

Cincinnati Shapers handle very heavy work—are powerful metal removers. They are dependable and trouble free on the most demanding jobs.

The extra long feed of the Cincinnati tool slide gives the needed range to shape the long blind hole of this large weldment. Dovetailed tool slide and accurately gibbed ram, with extended bearings, prevent chatter under these severe conditions. Table feed and power rapid traverse operate smoothly even with this 5300-lb. load.

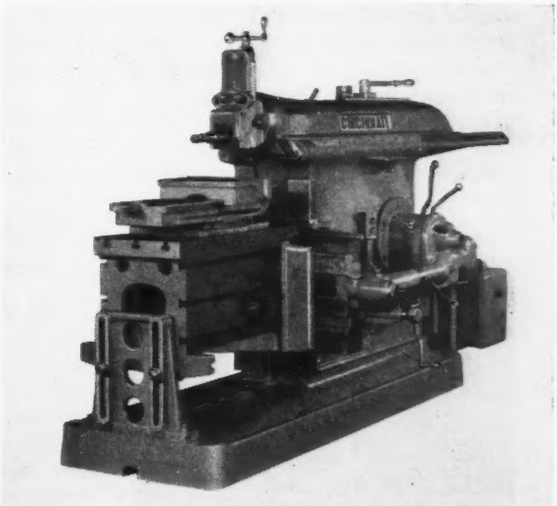
Cincinnati Shapers work to close limits and are profitable in both tool room and production departments.





This massive cross rail securely supports the apron on three automatically lubricated bearing surfaces. All controls are at the operator's position. The cross rail is square-locked to the column and automatically lubricated. Alignment is maintained by taper gibs.

This sturdy table support has the sliding action at the table and is gibbed to maintain alignment. Sliding surfaces are completely protected against dirt.



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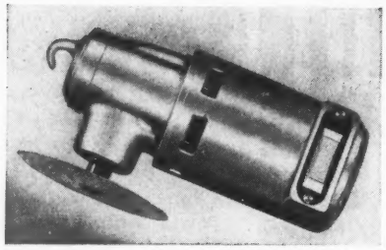


Fig. 1. Craft-Hollow disk grinder

Craft-Hollow Disk Grinder and Tap and Die Chaser

A new improved lightweight disk grinder and a new tap and die chaser have been announced by the Craft-Hollow Industries, Wallingford, Pa. The "Discette" grinder, shown in Fig. 1, makes possible precision grinding, shaping, and polishing at a comparatively low cost. The 12,000 R.P.M. motor of this grinder weighs only 4 1/2 pounds and is provided with a cooling system to permit long, continuous operation without overheating. Three types of abrasive disks are available.

The low-priced tap- and die-holding device, Fig. 2, is designed for extremely accurate thread cutting in sizes from No. 0–80 to 3/8–16. The equipment includes a knurled ring which can be held by hand for delicate threading work or by a torque bar for heavier threading jobs. The tap- and die-holders ride freely outside or inside the spindle, so that the knurled knob can be instantly released to permit precision thread length control and save taps or work from breaking under excessive cutting loads. The spindles supplied for lathes and drill presses have No. 1, 2, or 3 Morse taper shanks. A spindle with a straight shank can be furnished for use in jig borers, etc. 73

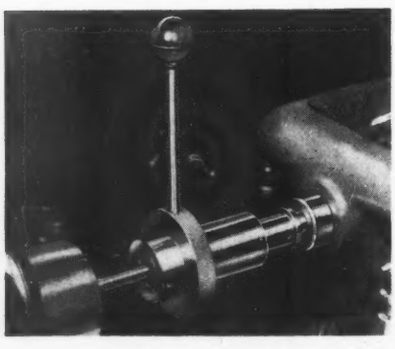
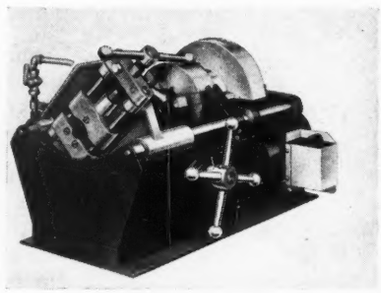


Fig. 2. Tap and die holder introduced by Craft-Hollow Industries

New Wheel Cut-Off for Toledo Pipe Machines

A choice of either wheel and roller or knife cut-off is available on a new 2-inch power pipe machine, known as the 999 super model, manufactured by the Toledo Pipe Threading Machine Co., Toledo, Ohio. The cutter-head of the wheel cut-off is equipped with two rollers and one cutter wheel, which is self-centering and easily fed by a handwheel.

If a knife cut-off is preferred, the machine can be furnished with four cutter knives, which leave a straight square-end cut. Blades are fed through a scroll by a small handwheel, and can be resharpened many times. Cutting is very rapid with either type of cut-off, a 2-inch pipe being cut off in ten



Pipe machine with wheel type cut-off built by the Toledo Pipe Threading Machine Co.

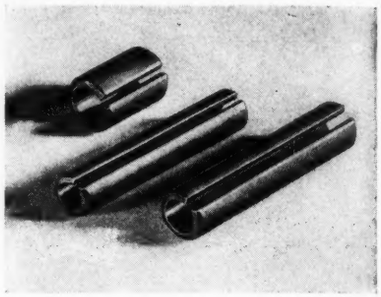
seconds. The new model, which has quick-opening die-heads, threads 2-inch pipe in twenty-two seconds. A thread gage shows the length of thread being cut.

A universal type 1/2-H.P. motor is used to drive the machine. The speed is adjusted automatically to suit the load. 74

"Rollpin" Self-Locking Dowel or Pivot Pins

The Elastic Stop Nut Corporation of America, Union, N. J., is introducing on the market a new all-purpose pressed-fit pin which incorporates a unique locking principle for metal fasteners. This new self-locking pin with chamfered ends, known as the "Rollpin," is adapted for use in a wide variety of applications for which dowel, pivot, tapered, and grooved pins are now employed. It has the advantage that it does not require a key or some supplementary fastening to hold it in place.

This pin was first employed in ordnance and radar equipment. Volume production methods now make it possible to use this multipurpose fastener for such equipment as the ordinary tacking tool, lubrication pump assembly



Self-locking "Rollpins" for dowel or pivot-pin applications, now being manufactured by the Elastic Stop Nut Corporation of America

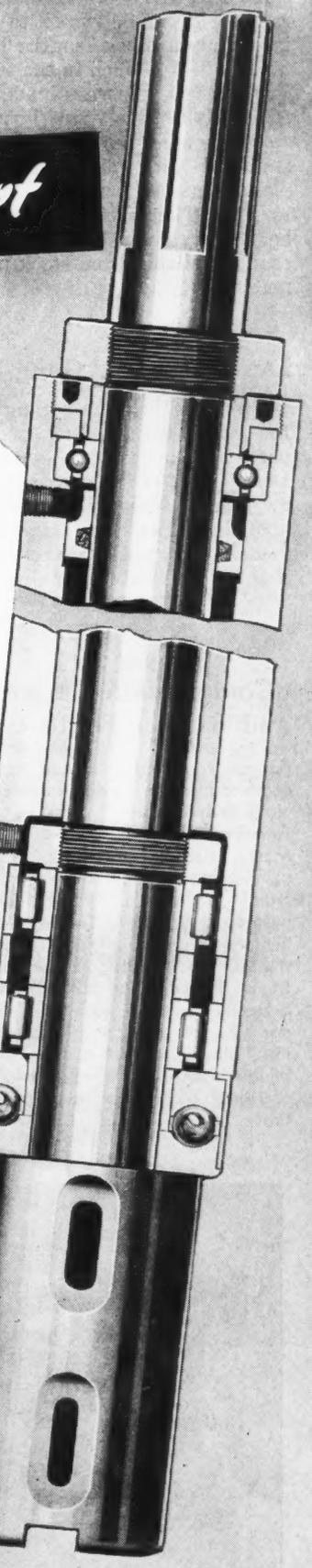
of a Diesel engine, and the vent window handle of an automobile.

The new pin consists of a piece of metal rolled into the shape of a cylinder with a gap or slot which parallels its long axis. Both ends of the cylinder are chamfered or beveled so that the pin can be driven and compressed into a hole somewhat smaller than the normal outside diameter of the pin. The slot permits compression of the cylindrical pin as it is driven in, and the resulting tension, caused by the constant pressure exerted by the Rollpin against the walls of the hole, secures it in position, even under extreme vibration and shock conditions.

The Rollpin can be easily and quickly inserted with hand tools or automatic jig assemblies, and can be quickly removed by driving out with a drift pin or pin punch. The pin also retains its locking characteristics after repeated insertions, and its shear strength exceeds that of a cold-rolled pin of equal diameter. The principle applications fall into the following five general groups: Fastening pins, pivot or hinge pins, cotter-keys, shafts, and dowels. It is especially suited for use as a shaft for mounting plastic gears, and because of its flexibility, it can be used to advantage with plastic materials to absorb some of the dimensional changes which take place in plastics with changing temperatures.

To obtain additional information on equipment described here, use Inquiry Card on page 233.

Unusual Tool Capacity
Unusual Spindle Support

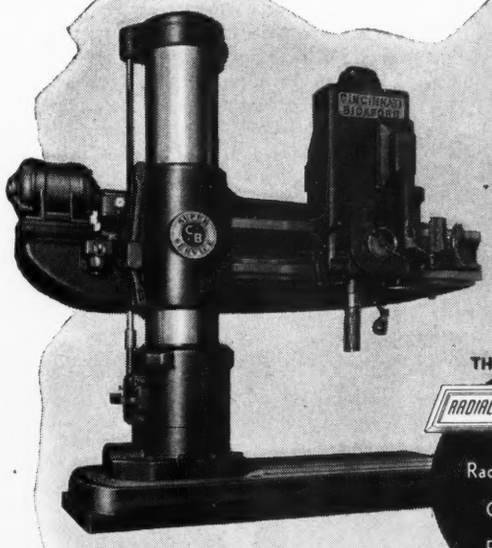


What is full spindle support? What does it accomplish? It's rigid support against thrust and radial load—at ALL positions of the spindle.

In performance, it means accurate, smooth power delivery and long, trouble-free operation.

The multiple spline driven Cincinnati Bickford Super Service Spindle—with its large thrust bearing and its special sliding sleeve—never feeds away from its bearings.

This modern, up-to-date design, with 36 speeds and 18 feeds, also gives a maximum tool capacity for any given size.



Write for Circular R-29 for details of construction of this Cincinnati Bickford Super Service Radial Drill.

This machine is furnished in sizes 11″ to 19″ diameter column, 3′ to 8′ arm.

THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½″ dia. col., 2½′ arm, to 26″ dia. col., 12′ arm.
General purpose Uprights, 21″ to 28″ sizes.
Production Uprights, 21″ to 28″.
Jig Borers, Portable Horizontals, Spacing Table Machines.

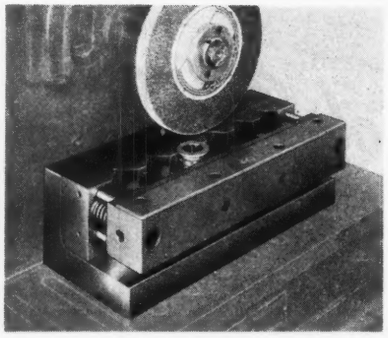
Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

Rollpins are now available in thirteen sizes to fit hole diameters ranging from 0.078 up to 0.500 inch and in stock lengths beginning with 3/16 inch in the smaller sizes. These pins are made from S A E 1095 steel and Type 420 stainless steel, and although the standard pins are not plated, plated finishes can be furnished to order. They are also made from beryllium copper, but are not generally available from stock in this material. 75

Dery Improved Gang Vises

Two new improved gang vises for precision grinding of small parts have been introduced by the Dery Tool & Die Co., Pine Meadow, Conn. These vises are available in three- and six-position models designed for rapid handling of intricate grinding jobs.



Three-position gang vise brought out by the Dery Tool & Die Co.

Both models incorporate patented equalizing blades, which automatically compensate for differences in work tolerances and eliminate "toeing in" of under size parts.

The three-position model, shown in the accompanying illustration, is designed primarily for use with a magnetic chuck, but may be had with modifications for clamping to conventional chucks. It has a capacity for holding work 3/4 inch by 1 1/2 inches. This vise holds work in a central position, thus making it possible to "flop" or turn the fixture over for grinding opposite sides without additional adjustments. For end grinding, the vise is positioned as shown in the illustration. The V-block vise face is provided to meet user's specifications.

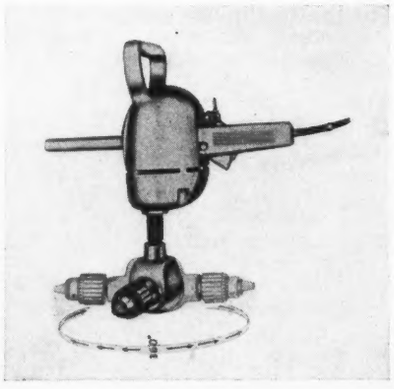
The six-position gang vise is designed for use on magnetic or non-magnetic chucks. It has a standard capacity for parts ranging from 1/8 to 1 inch and features a vise face which holds parts against a smooth, lapped surface for greater accuracy in the grinding of precision parts. The six-position models have been successfully used in the gang-grinding of fine aircraft parts without damage due to heat warpage. 76

Combination Respirator and Rubber Frame Goggle

Rubber frame goggle and respirator combined in one unit, fastened with either snap or rivet, brought out by the American Optical Co., Southbridge, Mass. Recommended for protection against chemical splashes, spray, light impact of foreign particles, and exposures to fine dust. The No. 700 rubber frame goggle can be replaced by the AO No. 701 goggle if a gas-tight fit is desired. The R2000 respirator protects against a variety of dusts or gases by means of specific cartridges or disk filters. It has a face mask of pliable rubber which provides for a comfortable fit over long periods of time. 77

Cummins All-Angle Head for Portable Electric Drills

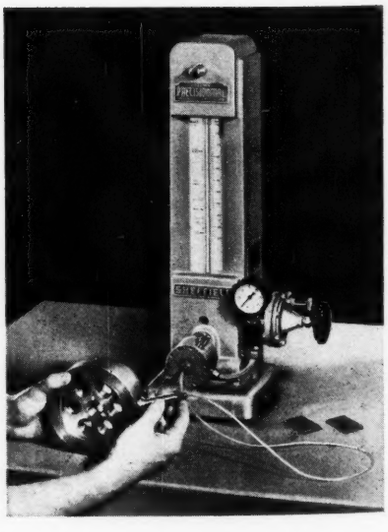
Two-speed, all-angle drilling head developed by Cummins Portable Tools, Division of Cummins Business Machines



Corporation, Chicago, Ill. A low speed of 275 R.P.M. adapts this drill for deep boring, while the high speed of 1100 R.P.M. makes it suitable for drilling small holes and for drilling wood as well as metal. The all-angle head makes possible the drilling of holes in places often inaccessible when using an ordinary drill. The head can be rotated through 360 degrees and, when set at a right angle to the body, has an overall width of only 7 1/2 inches. Capacities of the drill range from 1/2 inch in steel up to 4 inches in soft wood. The two-speed angle-head attachment weighs only 2 pounds and will fit any make 1/2-inch electric drill having a 1/2–20 threaded spindle. 78

Sheffield Precisionaire Surface Finish Comparator

Precision surface finish comparator announced by the Sheffield Corporation, Dayton, Ohio. Designed for the comparison of surface finish or surface roughness on flat surfaces or curved surfaces having a diameter greater than 3 3/4 inches, where the surface roughness ranges from 30 to 500 microinches r.m.s. The instrument does not give direct micro-inch r.m.s. readings, but shows a reading which is actually a measurement of the amount of air escaping over a circle approximately 1/8 inch in diameter. This has the important advantage of determining the quality of finish of a bearing surface over an appreciable area instead



To obtain additional information on equipment described here, use Inquiry Card on page 233.

$25,000

Saved on inspection in 24 months

This Sheffield machine gages and segregates refrigerator valve plates into 28 classifications—2,000 parts an hour. It has already paid for itself and is now saving a little more than $1,000 a month over the previous hand gaging method.

The job is exacting because these valve plates have a highly lapped finish. They can be completely ruined by even the slightest scratch, and that happened frequently when they were gaged by hand.

The parts are loaded into the machine and a button pressed. The machine sorts and stacks them in individual chutes according to size, without marring their finish.

If you inspect mass-produced parts, why not look into the possibilities of Sheffield gaging and segregating machines. You will gain the benefit of Sheffield's many years of experience in this field. *Write for engineering data.*

5480

the *Sheffield* corporation

MASTER CRAFTSMEN SHEFFIELD HEADQUARTERS

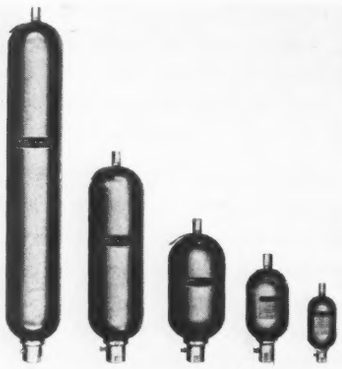
Dayton 1, Ohio, U. S. A.

GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS • CONTRACT SERVICES • THREADING TOOLS

of on a line. No special skill or training is necessary to operate this comparator. It is about 6 by 6 inches and is designed for use in the shop as well as in the laboratory. Supplied complete with right-hand scale reading from 20 to 110 micro-inches; left-hand scale graduations in black reading from 100 to 300 micro-inches; and graduations in red reading from 300 to 500 micro-inches. Can be attached to any plant air supply line or air compressor supply system. 79

Vickers Accumulators

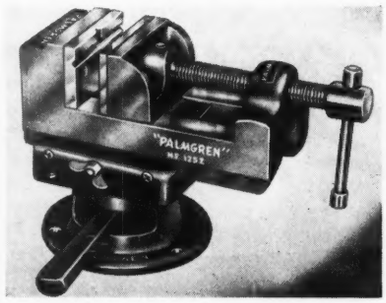
New line of accumulators for hydraulic control systems announced by Vickers Inc., Detroit, Mich. These accumulators are designed to supplement operation of any Vickers vane or piston type pump in circuits with intermittent high pressure requirements. An unusually high safety factor at 3000 pounds



per square inch operating pressure is achieved by a unique swaged-neck connection and one-piece, seamless alloy-steel shell construction. Accumulators are available in five models with capacities ranging from 75 to 2050 cubic inches. Standard accessories, including gage and adapter assembly, precharging and gaging hose assemblies, are also available. 80

Palmgren Bench and Drill Press Vise

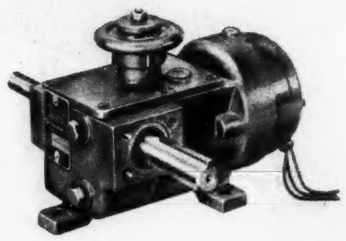
New Palmgren bench and drill press vise equipped with a swivel base and adapter for mounting on a bench. The vise can be rotated 360 degrees and



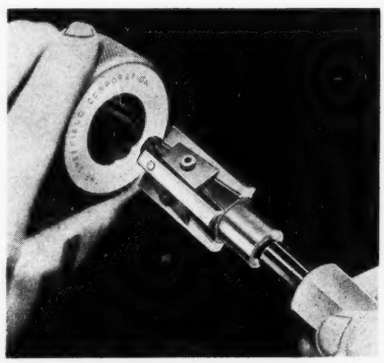
can be locked in any position. The swivel bench base can be bolted securely to a work bench for general shop work, and the vise can be easily and quickly removed for use on a drill press or other machine. The vise has jaws 2 1/2 inches wide, 1 inch deep, and an open capacity of 2 1/2 inches. Removable steel jaw plates are provided, one of which is V-grooved horizontally and vertically for holding round stock or irregularly shaped pieces. Made from gray iron casting. Weight, 10 pounds. Announced by Chicago Tool & Engineering Co., Chicago, Ill. 81

Janette Low-Speed Gearmotor

Gearmotor developed especially for application to combustion control systems, brought out by Janette Mfg. Co.,



Chicago, Ill. This low-speed, low-priced gearmotor uses double-reduction worm gearing to obtain an output speed of 0.4006 R.P.M. and approximately 220 pound-inches output torque. The speed reduction ratio is 4242.4 to 1. The motor is a special single-phase, 60-cycle, 115-volt, 1725-R.P.M. capacitor-run, capacitor-start type furnished with three leads, and is instantly reversible up to twenty times a minute. A 2 1/2-inch handwheel operates a clutch for disconnecting the motor and first reduction worm-gear. The unit weighs about 12 pounds, is 8 5/8 inches in length, 9 3/16 inches in width, and 5 11/32 inches in height with the foot mounting base. 82

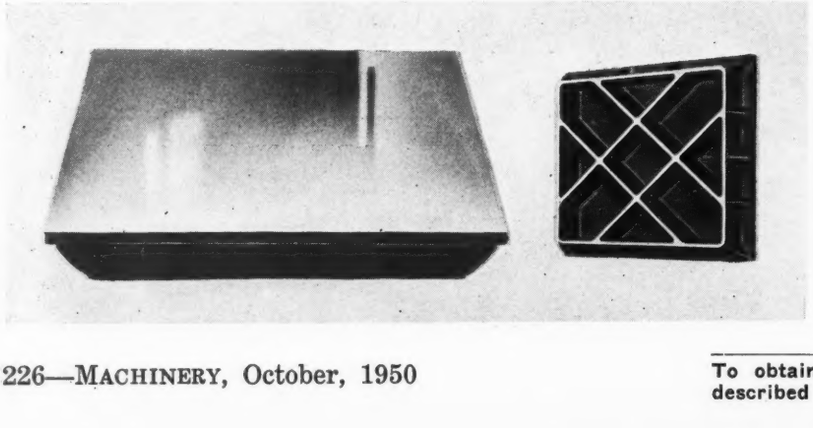


Sheffield Adjustable Spindle for Air Gages

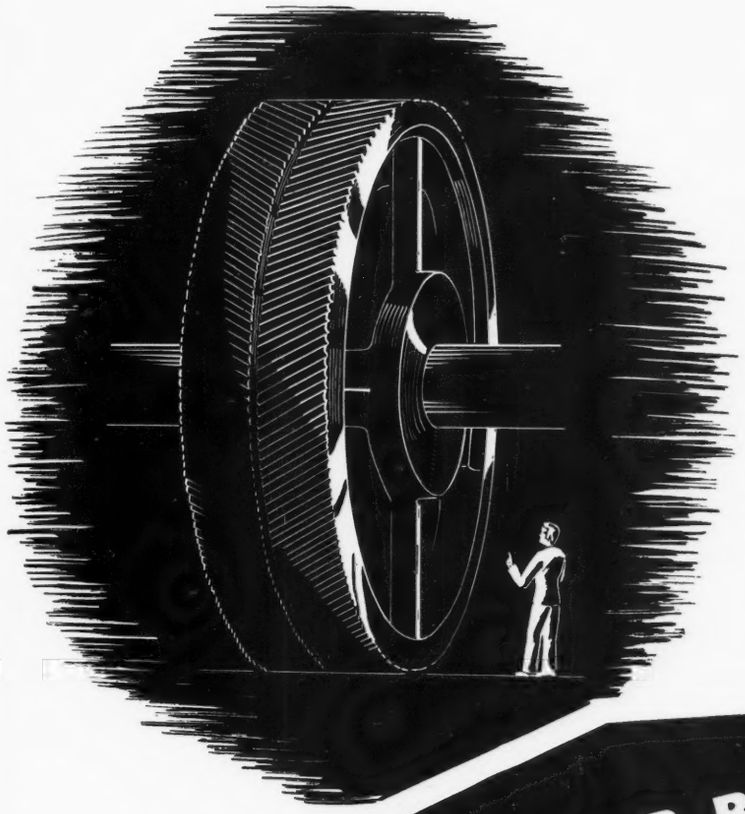
Adjustable gaging plugs or spindles designed for use on practically all makes of air gages, have been placed on the market by the Sheffield Corporation, Dayton, Ohio. These spindles are of the ball-jet contact type and are available in either through-hole or blind-hole styles. They provide a relatively inexpensive means of precisely measuring internal diameters within a range of from 1 to 3 inches, inclusive. No master rings are required for setting the spindle to size, since this is done with a special fixture and gage-blocks. These new precision adjustable spindles are recommended for air gages having an amplification of 2000 to 1 or less, and in some instances, the spindles can be set to size with sufficient accuracy to permit their use on gages of considerably higher amplification. 84

Delta Surface Plate

Surface plate which can be easily and economically adapted for precision work by simply scraping to a master plate. Brought out by the Delta Power Tool Division, Rockwell Mfg. Co., Milwaukee, Wis. Heavy ribbing is employed to insure that the true flat surface retains its accuracy. There is a clamping edge on all four sides to which angle-plates, vises, etc., can be attached. The edges are machined square with one another and with the surface. 83



To obtain additional information on equipment described here, use Inquiry Card on page 233.



IS YOUR GEAR DEPARTMENT READY?

to meet competitive production rates?

to meet competitive costs?

AS BIG OR BIGGER AS SMALL OR SMALLER

Michigan's "1950" production gear finishers are designed to produce all ranges of spur and helical gear sizes—external or internal; continuous runs or job lots—more accurately, at lower cost. Here they are:

#861—for gears of ¼" to 4" OD
#900—for gears 1" to 8" OD
#870—for gears 1" to 18" OD
#873—for gears 2¼" to 24" OD
#865—for gears 4" to 48" OD

PLUS—finishers for gears up to many feet in diameter

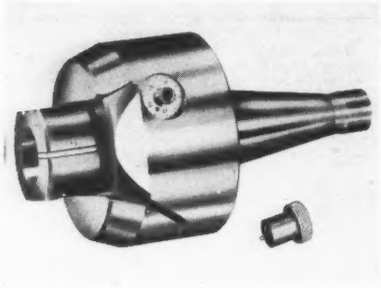
Ask for bulletins by machine number.

COMPLETE from blank to finished gear EQUIPMENT

MICHIGAN TOOL COMPANY 7171 E. McNichols Road Detroit 12, U.S.A.

Everede Boring Head

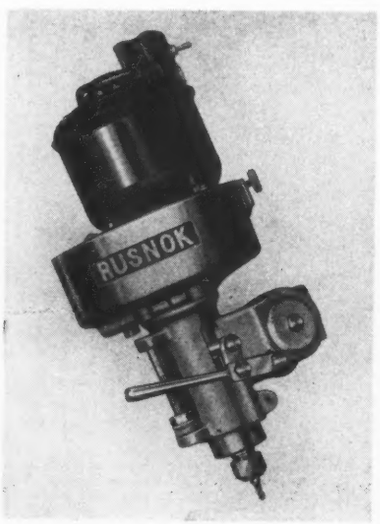
Intermediate size offset boring head brought out by the Everede Tool Co., Chicago, Ill., to supplement boring heads of other sizes now manufactured by the company. This new size boring head, known as No. 3-50, is 3 11/16 inches in diameter and has a maximum boring capacity of 4 1/2 inches. When equipped with an extension attachment, it is possible to increase this capacity 100 per cent. This head contains the

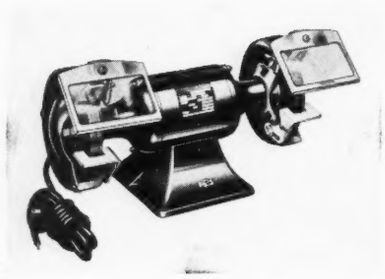


versatile features of both the smaller and larger models and has been developed especially for use in popular size vertical mills, jig boring machines, and turret lathes. 85

"Convertical" Milling Attachment

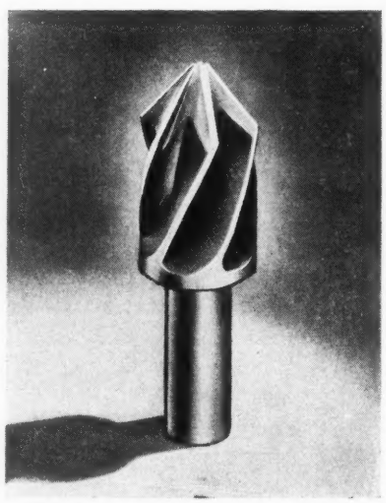
Low-cost vertical milling attachment for bench or floor type milling machines, brought out by Rusnok Tool Works, Chicago, Ill. This attachment, known as the "Convertical," allows full use of table travel and provides for quick rigid single and compound angular settings. The five spindle speeds range from 380 to 5200 R.P.M. Speed can be changed quickly and easily through slight rotation of the motor. The quill travel is 1 1/2 inches. The locking micrometer depth stop has 0.001-inch graduations. 86





Delta Grinder

New 1/3-H.P. low-cost grinder announced by the Delta Power Tool Division, Rockwell Mfg. Co., Milwaukee, Wis. It is adapted for grinding, polishing, buffing, and wire-brushing operations. Has shatter-proof glass safety shields and a steel spark guard at the top of each wheel. Tool-rests for complete support of work are fully adjustable to any grinding angle. The motor has sealed, lubricated-for-life ball bearings, and the wheels are accurately balanced to eliminate vibration. The grinder measures 20 inches from side to side with safety shields, is 9 inches high, and 8 inches deep. 87

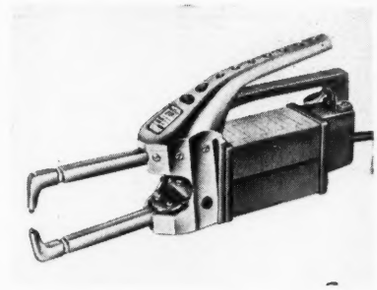


"Quad" Countersinking, Chamfering, and Burnishing Tool

Versatile four-way rotary tool of off-center flute design brought out by M. A. Ford Mfg. Co., Inc., Davenport, Iowa. This tool was designed for economical, rapid, and chatterless countersinking, chamfering, and boring operations. Also adapted for valve-seat finishing. Because of its four primary applications, this new tool has been named the "Quad." Operates in power equipment at speeds from 25 to 75 surface feet per minute, providing a fine finish when used dry at relatively low speeds. Use of a water-soluble coolant or cutting oil is recommended, however, for fine finish. Can be used by hand for light chamfering operations. Adaptable for use on cast iron, steel, bronze, brass, copper, aluminum, magnesium, Bakelite, and plastics. 88

Portable Spot-Welder

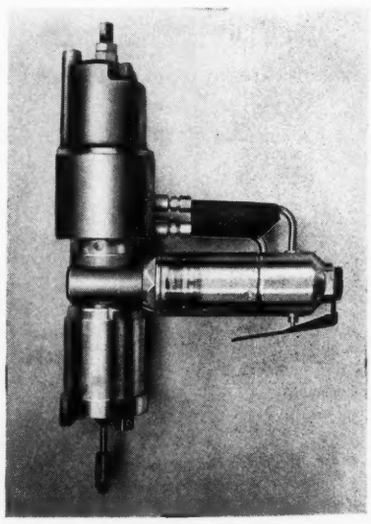
Portable spot-welder, known as the "Zip," introduced by Mid-States Welder Mfg. Co., Chicago, Ill. Patented features include fixed top tong, newly designed adjustable curved tips, and overall construction developed to afford greater ease of handling and make possible scores of new spot-welding



applications. Welds mild steel, stainless steel, galvanized iron, terne plate, and magnesium up to 1/8 inch combined thickness of metal. Models are available for either 110- or 220-volt alternating-current lines. The unit is portable, weighing 23 pounds. 89

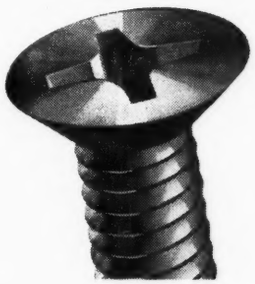
Automatic Countersink

Portable, air-powered countersinking tool which supplies its own thrusting action and has a self-locking grip that holds the tool firmly to the work sheet while it is in operation. Manufactured by Buckeye Tools Corporation, Dayton 1, Ohio, under exclusive license granted by the Boeing Airplane Co. This tool requires no manual effort on the part of the operator other than inserting the mandrel in the hole to be countersunk.



To obtain additional information on equipment described here, use Inquiry Card on page 233.

Stamping a New "Buy Sign" on the minds of 14,000,000 Buyers



THE SATURDAY EVENING POST

. . . this new campaign in means more business for manufacturers who assemble their products with

AMERICAN PHILLIPS SCREWS

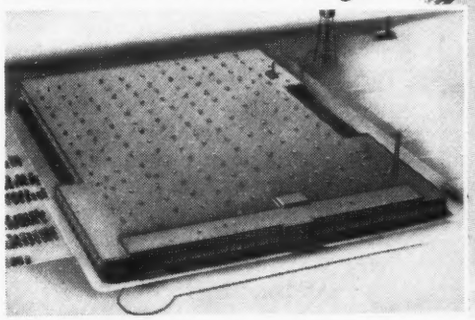
For years, American has been a "PHILLIPS-HEADquarters" . . . engineering these modern fasteners into all types of products.

Today, American joins in this new campaign in which millions of users of manufactured products are being told to look for the clue of extra quality...

"The Phillips Cross-Recess Marks the Spot . . ."

A symbol that quality is built into a product with the modern Phillips fastener.

American, with its new plant and equipment at Willimantic, Connecticut, is in a stronger position than ever before to meet the ever growing demand for Phillips fasteners. In addition, the facilities at its Norristown, Pennsylvania, plant and the large warehouse stocks maintained in Chicago have been established to help service distributors and users of American Phillips Cross-Recessed-Head Screws. Write, telling us how American can be of help to you!



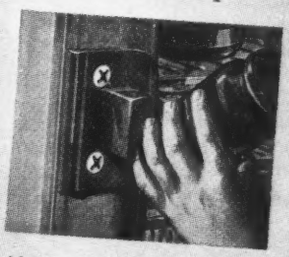
AMERICAN SCREW COMPANY

Plants at Willimantic, Conn., and Norristown, Pa.

Warehouses at: Chicago 11: 589 E. Illinois St. Detroit 2: 502 Stephenson Bldg.

Can you find the clue...

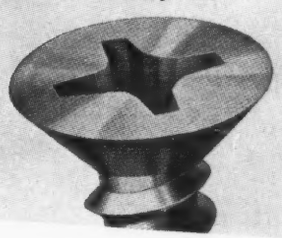
...to quality?
✕ marks the spot...



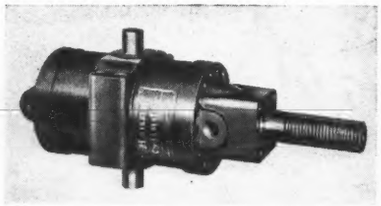
Yes! a **PHILLIPS SCREW**

You don't have to be a super-sleuth to detect the sign of quality on a modern product. Just look for Phillips Cross-Recessed-Head Screws. Used on everything from refrigerators to cattle trailers, these famous screws make possible creep-free tightness at all fastening points. They're your assurance that a product is well built.

PHILLIPS *Cross-Recessed-Head* SCREWS *on sale at hardware, automotive and mill supply outlets.*



Expansion of the mandrel locks the tool in the operating position. Drilling speed and depth of cut are predetermined and automatically controlled. When countersinking operation is completed, mandrel contracts, permitting removal of tool from hole. Automatic operation also assures perfect concentricity between the hole and the countersinking cut. Designed for countersinking holes 3/8 inch in diameter and larger. Available in capacities ranging from 3/4 inch to 1 1/8 inches across the mouth. 90

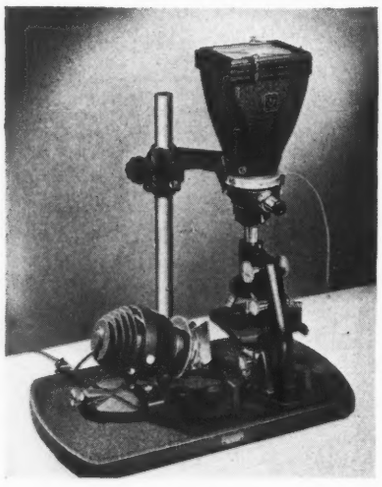


Hanna Hydraulic Cylinder

High-pressure hydraulic cylinder, designated Model HP-17, which is one of complete new line brought out by the Hanna Engineering Works, Chicago, Ill., to meet J.I.C. standards. Designed for working pressures up to 1500 pounds per square inch. Eight standard mounting styles are available, with units to meet every mounting requirement for smooth efficient push, pull, lift, press, clamp, or control power in a wide range of applications. 91

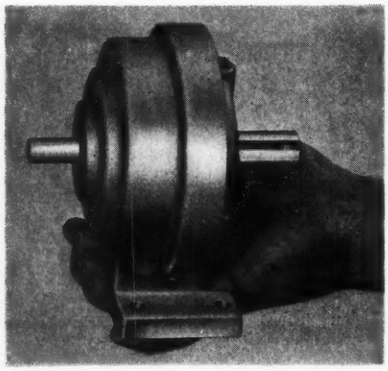
Photomicrographic Cameras

A new series AO Spencer 35-millimeter and 4- by 5-inch photomicrographic cameras, announced by the American Optical Co., Instrument Division, Buffalo, N. Y., has been designed to replace a line of cameras discontinued during World War II. These improved instruments are sturdily constructed and simple to operate. They are especially designed and priced to meet laboratory and clinical needs. A unique revolving body permits 360-degree rotation of the camera backs, thus eliminating the need for an expensive circular revolving stage. Three models are available—a 4- by 5-inch camera with Universal shutter and telescopic focusing eyepiece; a 35-millimeter film camera with Universal shutter and telescopic focusing eye-piece; and a 4- by 5-inch camera with Alphax shutter. 92



"Heliocentric" Speed Reducer

New "Heliocentric" speed reducer, designed to save costs and conserve space on in-line applications in the 1/4- to 1-H.P. range. Announced by the Universal Gear Corporation, Indianapolis, Ind. The Model 5-E unit is suitable for



any straight-line installation in which the input speed does not exceed 1800 R.P.M. and the maximum torque 1000 inch-pounds. 93

* * *

Equipment Replacement Work Sheet

With the development of the MAPI machinery replacement formula, there has been increasing interest in the replacing of obsolete machine tools. Some machine tool builders have devised forms for analyzing equipment replacement problems based on this formula.

A work sheet that compares the relative costs and advantages of operating present equipment in a plant and proposed new equipment for the same work has been drawn up by the Gisholt Machine Co., Madison 10, Wis., and is being made available to those interested. This sheet is applicable not only to Gisholt machines, but also to other types of machines. The company will furnish any number of copies of this form without charge to those who request them.

Lincoln Undergraduate Awards for Papers on Arc-Welding

Young engineers in twenty-three states and forty different engineering schools were recently awarded prizes in the 1949-1950 Engineering Undergraduate Award and Scholarship Program competition sponsored by the Lincoln Foundation. A total of $5000 was awarded in amounts ranging from $1000 down to $25. The sum of $1750 was given in scholarship funds to schools. The awards are made for papers on arc-welded design, fabrication, maintenance, or research.

Gordon Dickson Orr, Jr., of the Rensselaer Polytechnic Institute, won the first prize of $1000 for his paper "A Comparison of Framing in Welded Steel and Aluminum." The second prize of $500 was divided between Francis Springer and Earle Compton, of the State University of Iowa, for their joint paper "Investigation of Some Practical Applications of the Low-Hydrogen Type Electrodes." The paper that won the third prize of $250, entitled "A Study of Arc-Weld Fabrication of Turret Tools for Turret Lathes," was written by Jerry J. Watson of Oregon State College.

The current competition extends over the period of June 1, 1950 to May 31, 1951. Further information can be obtained from the James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.

* * *

Europeans Study Aluminum Operations

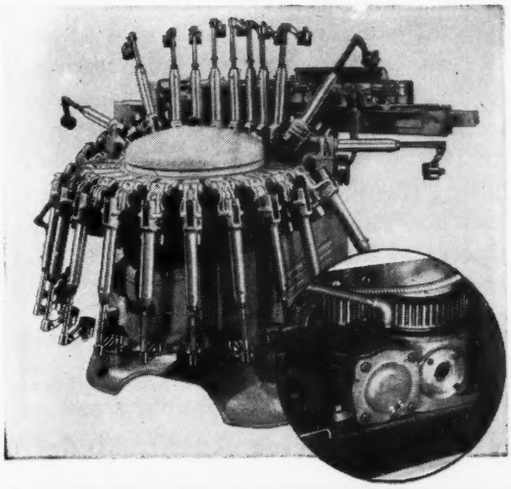
Certain phases of the operations of the Doehler-Jarvis Corporation at its Toledo, Ohio, and Grand Rapids, Mich., plants have been made available for observation to a team of European experts in a secondary aluminum study being made in this nation under the sponsorship of the Economic Cooperation Administration.

The purpose of the undertaking, which includes visits to firms in the metal-working industry in fifteen American cities, is to study secondary aluminum operations in America, so that Europe will be able to economize on its consumption of virgin aluminum by a more exhaustive use of secondary aluminum.

To obtain additional information on equipment described here, use Inquiry Card on page 233.

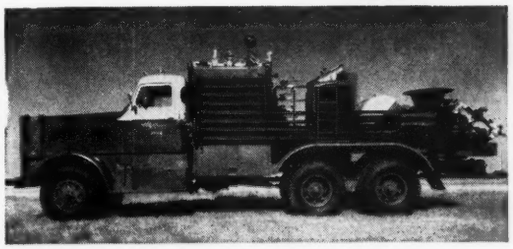
For any kind of continuous load
—with or without 'shock'—

STANDARD CONE-DRIVE GEARS and REDUCERS
SAVE SPACE—SAVE TROUBLE—SAVE MONEY



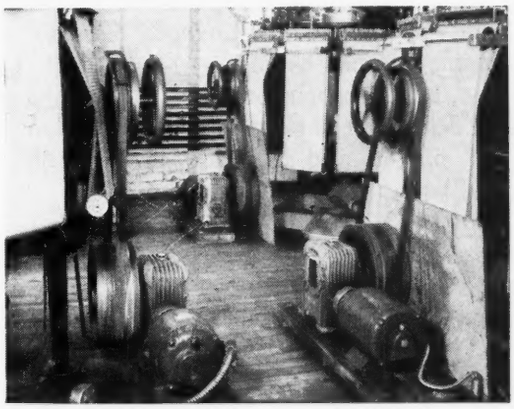
MIXING "POP" AT 190 QUARTS PER MINUTE

Liquid Carbonic Corporation's beverage mixing machines—over 200 of them—are driven through Cone-Drive standard gears. The 5″ center distance units are so compact —they're a cinch to design into the base of the machine. Rated capacity is 1.82 hp. at 792 rpm, so there is plenty of 'reserve', too.



PUMPING CEMENT AT 9000 psi

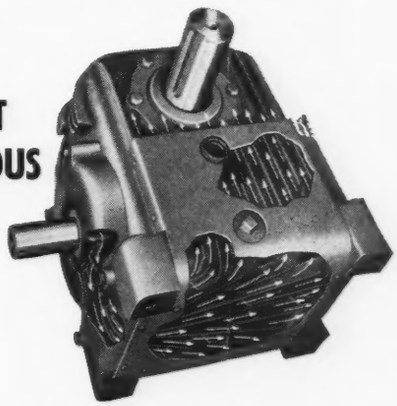
Cementing oil wells is a tough job calling for continuous PLUS shock loads. To make sure that its 15½″ center distance Cone-Drive Gears (rated at 68.3 hp at 150 rpm, Class II service) would do the trick on an even bigger pump, Halliburton subjected them to a continuous 141 hp at that speed. The housing stayed cool enough to put your hand on it. To handle that load, you'd need a 36 in. center distance non-Cone-Drive gearset. You couldn't even get it on a Halliburton truck.



MOTORIZING GIANT KNITTING MACHINES

When Winona Knitting Mills motorized its rotary knitting machines individually, they picked Cone-Drive reducers for this 24-hour-a-day, 6-days-a-week service. Each of the units handles 1½ hp at 1150 rpm.

and for LOWEST "CONTINUOUS LOAD" DRIVE COST



. . . there are always the Cone-Drive Gears fan-cooled and water-cooled reducers—available in *standard* and special sizes and ratios to fit practically any drive need. Check their cost against comparable reducers, fan or non-fan-cooled. You'll be amazed at what you can save.

CONE-DRIVE GEARS®

CONE-DRIVE GEARS
Division, Michigan Tool Company

DOUBLE ENVELOPING GEAR SETS & SPEED REDUCERS

7171 E. McNichols Road • Detroit 12, U.S.A.

Self-Centering Roll Eliminates Need for Material Guides

An ingenious application of a natural force is the basis of a new self-centering roll for conveying various materials. The principle of "planar action" was built into working models by E. T. Lorig, chief of the senior engineering staff of the Carnegie-Illinois Steel Corporation, subsidiary of the United States Steel Corporation and is now being used in various steel handling applications.

Fundamentally, the Lorig self-centering roll is a slightly crowned roll cut transversely at the center. The two halves are fixed to rotate as a unit. The working surfaces of the two parts are approximately horizontal, while the axes are at an angle. In this way, the planes or lines of force in both halves twist evenly toward the center in the direction of movement, conferring a self-centering action on any materials passing over the rolls. Consequently, side guides are unnecessary to keep materials on the conveyor.

The rolls have been tested for such a diversity of applications as run-out tables, feed and guide rolls for electrolytic tinning, galvanizing, and pickling lines, gravity conveyors, belt pulleys and conveyors, and similar applications in the steel industry. It is believed that this principle will be found applicable to material-handling problems in other industries as well.

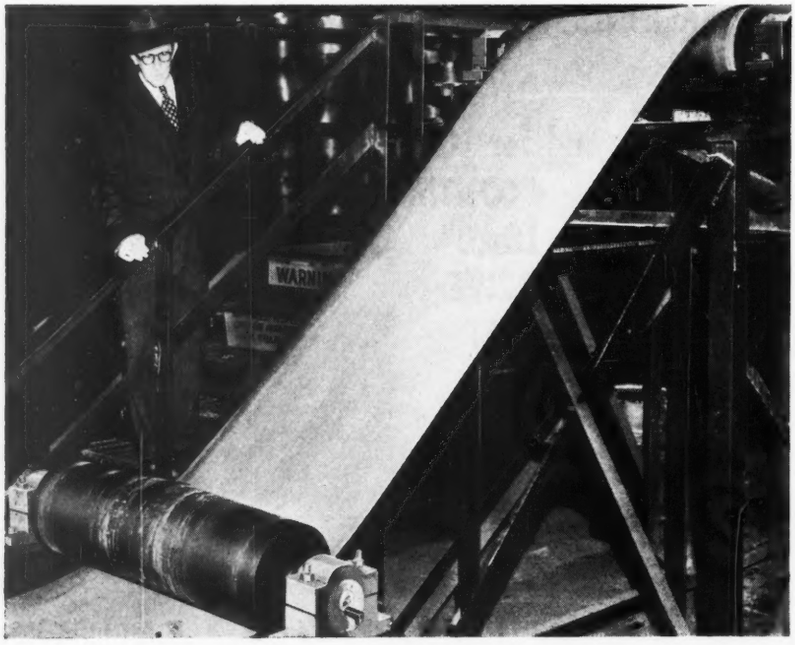
One of the more unusual variations in design is a laminated rubber roll, with each of the laminations coned on the same principle as the split-crown roll. A stainless-steel belt operating between two of these laminated rolls exhibits the same strong centering action inherent in the original design. Conical rolls, split across the center and nested to form a circular conveyor table, have such a strong centering action that objects of any size or shape (other than spherical) being rotated on the table will not deviate from their lines of travel even when the table is tilted from the horizontal.

The width of conveyor tables and run-out tables can be reduced to a minimum, with no edge or corner damage to the material being conveyed or risk to the operator. Gravity conveyors, whether straight or curved, can be built to operate efficiently with no guide rails. Belt drives are practical and safe, even with an overhung take-off. Operating an self-centering rolls, stainless-steel conveyor belts can now be safely used under low operating tensions.

* * *

C. E. Wilson to Receive A.S.M. Medal for Advancement of Research

Charles E. Wilson, president of the General Motors Corporation, will receive the American Society for Metals' 1950 Medal for the Advancement of Research during the thirty-second annual National Metal Congress and Exposition, to be held in Chicago, October 23 to 27. This award was established in 1943 to recognize the industrial executive who, over a period of years, has consistently sponsored metallurgical research or development, and has helped, by his influence in making available financial support, to advance the arts and sciences related to metals. Award of the medal, plaque, and citation will be made at the annual banquet of the Society.



Installation of a self-centering roll on the pickling line of a 43-inch hot-strip mill eliminated the necessity for using guides and the guide looping of material in the pickling bath

By E. S. Salichs

BETWEEN GRINDS

Hash the Hammer

After a summer's muscular activity wielding a racquet, club or lawn-mower, it is very possible that you can step up to a 16-ounce hammer and break its claws with a 16-pound sledge. This test of brawn is being offered by the Palmer Welloct Tool Co. at the National Hardware Show which opens in New York City on October 2. Last year the hammer remained intact after a week of beating, the three-way heat-treated super alloy steel in the hammer accounting for its resistance to all comers. But there must be a triple-threat super man around to best the Bessemer.

Catch As and If You Can

Rod catching in a wire rod drawing mill is one of the most exclusive occupations in American industry, with only a few hundred rod catchers in the country, according to "WE," house organ of Western Electric Co. To be one, all you have to do is complete one "pass" every 20 seconds thusly: First, you snatch a red hot rod traveling at better than 15 feet a second, with iron tongs as it comes snaking through the rollers; then you pivot as the rod runs down into a looping pit; and lastly, you insert the end in the next reducing groove. Now all together in time, 1-2-3, oops.

A Chuck to Remember

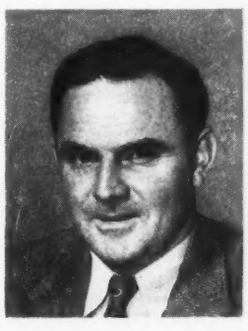
Engineer from Crown Can Co. wrote to us that he remembered seeing in MACHINERY about twenty years ago a "write-up on the design and construction of an oval chuck showing principle employed and assembly lay-out." Could we locate it for him? It was in June, 1933, MACHINERY, pages 658-60, "Design and Application of Elliptic Chucks."

She Does the Engineering

Bernard Lester received the following letter and passed it on to us: "My fiance is going to a Sales Engineering school next week and I have spoken to him about the booklet 'The Sales Engineer and His Problems,' and he would like very much to take a copy of it with him. I would be very grateful if you would send me this booklet before Sunday, September 17, as this is the date on which he leaves for Syracuse and the engineering school."

High Note Shorn Now Alto Horn

Study of Chicago city noises made by Armour Research Foundation included automobile horns, found to be excessively raucous in their higher pitches. In Armour's anechoic chamber it was decided high notes could be cut without loss of effectiveness—which means that as a pedestrian you'd jump just as pronto but mind the noise less. (Anechoic isn't in our dictionary—but as you gather, it refers to an insulated room without distracting sounds, especially designed for sound measurements. Good for income tax figuring, too.)



PIPER WENT WEST—Chicago-born Thomas E. Piper, chief materials and process engineer at Northrop Aircraft, Inc., Hawthorne, Calif., has spent twenty years in California industries. He is returning to Chicago momentarily to deliver a speech at the Metal Show in October on hot forming, which will also be the subject of his leading article in November MACHINERY. Graduated in 1932 from the University of Wyoming with a degree in chemistry and metallurgy, Mr. Piper spent the next two years doing graduate work at the University of Southern California. His experience varied as he became, in turn, technician in the process department of Technicolor Motion Picture Corporation, chief metallurgist for the Emsco Piston Co., and technical expert for American Potash & Chemical Co. Then he entered the aircraft industry as head of the chemical and metallurgical laboratory at Douglas Aircraft in Santa Monica. For the last ten years he has been with Northrop and is credited with having a finger in many developments of the engineering staff, including the Heliarc welding process. Mr. Piper lives in Santa Monica with his wife and two little pipers. While he hunts and fishes occasionally, he "relaxes" with a rake, hammer and paint brush frequently.

News of the Industry

California

ADEL PRECISION PRODUCTS CO., Burbank, Calif., manufacturer of hydraulic control equipment, has been consolidated with the GENERAL METALS CORPORATION of Los Angeles and Oakland, Calif., and the ENTERPRISE ENGINE & FOUNDRY CO. of San Francisco. In the future, the company will be known as the ADEL DIVISION, GENERAL METALS CORPORATION. Offices of the newly formed consolidation are located in San Francisco. WILLIAM E. BUTTS is president; FRED T. MILLER, vice-president of engineering and sales; RICHARD A. STUMM, vice-president of manufacturing; and WILLIAM A. DERIDDER, chairman of the board.

KARL A. PANITZ has been made chief engineer of the National Motor Bearing Co., Inc., Redwood City, Calif.

District of Columbia and Maryland

COMMANDER R. E. W. HARRISON, who has conducted a consulting engineering office at Chambersburg, Pa., is returning to active duty as staff officer in the Bureau of Ships, Navy Department, Washington, D. C. Commander Harrison served in the U. S. Navy on active duty from July, 1940, to the end of 1944, the first two years as machine tool contract officer for the department, and the latter two years as a special assistant to James V. Forrestal, then Under Secretary. His present assignment in the Bureau of Ships will again bring him into active contact with the manufacturing situation, the productive efficiency of which is still, in large measure, a product of good machine tool equipment.

ALEXANDER MILBURN, INC., manufacturer of oxy-acetylene cutting and welding apparatus, has moved to new headquarters at 1231-45 Ridgely St., Baltimore 30, Md., where the entire manufacturing and sales operations of the corporation will be carried on.

Illinois

E. A. HENRY has been appointed wire die specialist in charge of the new die finishing shop opened by the Firth Sterling Steel & Carbide Corporation in Chicago. Assisting Mr. Henry will be ANDREW MARHEFKA, who has had nine years experience in all phases of the die finishing, and during the last two years has spent some time on carbide die service work in plants in the Chicago area. Previous to joining Firth Sterling, Mr. Henry was die engineer for the Vascoloy Ramet Corporation in Waukegan, Ill.

(Left) E. A. Henry, wire die specialist in charge of new Firth-Sterling die finishing shop in Chicago. (Right) Andrew Marhefka, recently appointed assistant to Mr. Henry

FRED K. KNOHL, formerly in charge of field engineering for Shakeproof, Inc., Chicago, Ill., manufacturer of fastening devices, special stampings, and screw products, has been appointed chief engineer of the company. ELBERT FAUST, production superintendent of the Elgin, Ill., plant, has been named assistant works manager, and will be succeeded as production superintendent by HENRY ARCHER, previously general foreman.

WESTCOTT CHUCK CO., Oneida, N. Y., has appointed the NORMAN DURRIE SALES CO., 605 W. Washington Blvd., Chicago, Ill., district representative of the company in northern Illinois, northern Indiana, eastern Iowa, eastern Wisconsin, and the upper peninsula of Michigan. S. A. DINSMORE previously handled the sales in this territory.

GUNNER E. GUNDERSON, vice-president of the Brad Foote Gear Works, Chicago, Ill., was named president at a recent meeting of the board of directors. Other officers elected at the meeting were E. J. LINDGREN, vice-president and H. J. BUESCHER, secretary-treasurer.

BENJAMIN SAMPSON has been made general sales manager of the K. H. HUPPART CO., Chicago, Ill., manufacturer of electric laboratory and industrial furnaces and ovens.

O. W. KLIMA has been appointed chief engineer of the Abart Gear & Machine Co., Chicago, Ill.

Indiana and Kentucky

AB. MARTIN has been appointed assistant manager of the Fort Wayne, Ind., Works of the Apparatus Department of the General Electric Co., Schenectady, N. Y. He was formerly manager of the company's Oakland, Calif., Works.

D. C. WEDLICK has been appointed district sales engineer for the Michigan Tool Co., Detroit, Mich., in the Muncie-Anderson, Ind., area. His headquarters will be at 401 Willow Drive, Muncie.

ADMIRAL JONAS H. INGRAM, U.S.N. (Retired) was elected vice-president of the Reynolds Metals Co., Louisville, Ky., at a recent meeting of the board of directors. He will have charge of executive sales.

MACHINERY'S DATA SHEETS 667 and 668

MECHANICAL PROPERTY RANGES OF INCONEL

Form and Temper	Tensile Strength, Pounds per Square Inch	Yield Strength (0.20 Per Cent Offset), Pounds per Square Inch	Elongation in 2 Inches, Per Cent	Hardness	
				Brinell (3000 kg.)	Rockwell
Rod and Bar, Cold-drawn					
Annealed	80,000–100,000	25,000–50,000	55–35	120–170	65B–85B
As drawn	105,000–150,000	80,000–125,000	30–10	180–290	90B–30C
Rod and Bar, Hot-rolled					
Annealed	80,000–100,000	25,000–50,000	55–35	120–170	65B–85B
As rolled	85,000–120,000	35,000–90,000	50–30	140–210	75B–95B
Forged	85,000–120,000	35,000–90,000	50–30	140–210	75B–95B
Wire, Cold-drawn					
Annealed	80,000–105,000	25,000–50,000	50–25	.....	.....
Regular temper	130,000–175,000	115,000–165,000	12–3	.....	.....
Spring	165,000–185,000	150,000–175,000	10–2	.....	.....
Plate, Hot-rolled					
Annealed	80,000–105,000	30,000–50,000	55–35	120–180	65B–88B
As rolled	85,000–110,000	35,000–65,000	50–30	140–210	75B–95B
Sheet, Cold-rolled					
Annealed	80,000–100,000	30,000–45,000	55–35	.....	88B max.
Deep-drawing and spinning quality	80,000–100,000	30,000–45,000	55–40	.....	65B–80B
Hard	125,000–150,000	90,000–125,000	15–2	.....	24C min.
Strip, Cold-rolled					
Annealed	80,000–100,000	30,000–45,000	55–35	.....	84B max.
Spring temper	145,000–170,000	120,000–160,000	10–2	.....	30C min.
Tubing, Cold-drawn					
Annealed	80,000–100,000	30,000–50,000	55–35	.....	88B max.
As drawn	110,000–160,000	70,000–140,000	25–2	.....	90B–30C
No. 1 temper	100,000 max.	30,000–50,000	50–35	.....	90B max.
No. 2 temper	105,000–125,000	55,000–95,000	27–13	.....	90B–20C
No. 3 temper	130,000–160,000	105,000–140,000	15–4	.....	19C–34C
Castings (As cast)	70,000–95,000	30,000–45,000	30–10	160–190	.....

MACHINERY'S Data Sheet No. 667, October, 1950

Compiled by the International Nickel Co., Inc., New York

MECHANICAL PROPERTY RANGES OF "K" MONEL*

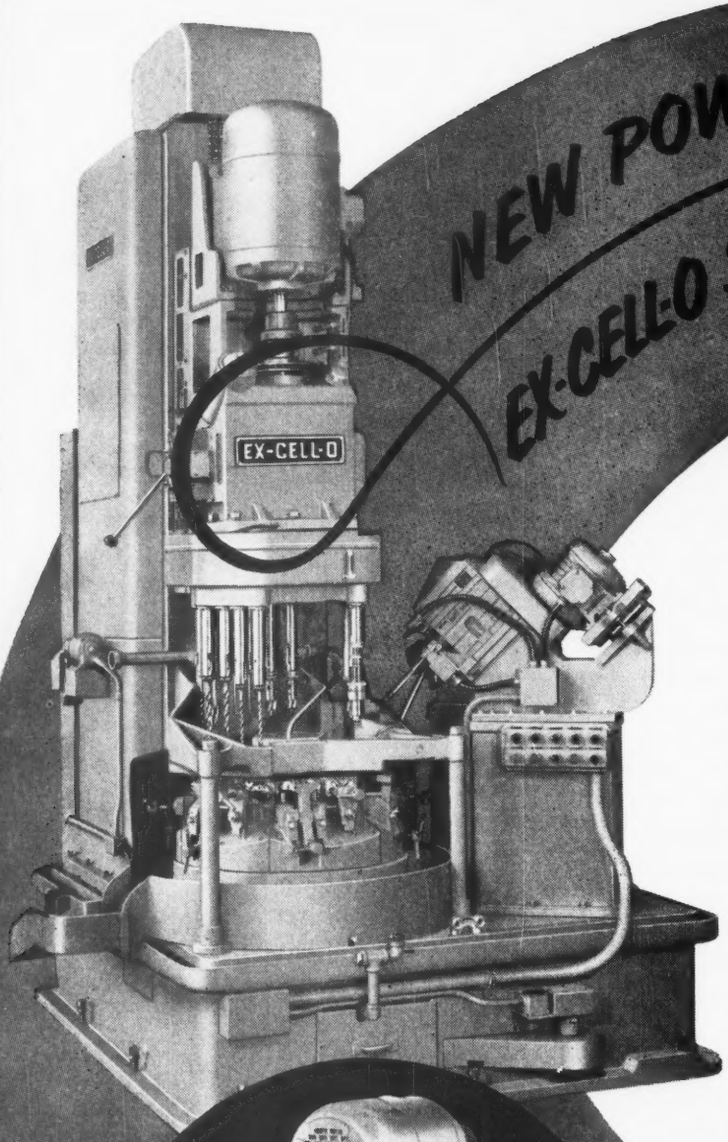
Form and Temper	Tensile Strength, Pounds per Square Inch	Yield Strength (0.20 Per Cent Offset), Pounds per Square Inch	Elongation in 2 Inches, Per Cent	Hardness	
				Brinell (3000 kg.)	Rockwell
Rod and Bar, Hot-rolled					
Hot-finished	90,000–120,000	40,000–90,000	45–25	140–240	75B–100B
Hot-finished, age-hardened	140,000–170,000	100,000–125,000	30–20	265–325	27C–35C
Rod and Bar, Cold-drawn					
Annealed	90,000–110,000	40,000–60,000	45–35	140–180	75B–90B
Annealed, age-hardened	130,000–160,000	90,000–110,000	30–20	240–300	23C–32C
As drawn	100,000–135,000	70,000–100,000	35–13	175–260	88B–26C
As drawn, age-hardened	140,000–170,000	100,000–130,000	30–15	265–325	27C–35C
Strip and Sheet, Cold-rolled					
Annealed	90,000–105,000	40,000–65,000	45–25	.....	75B–85B
Annealed, age-hardened	130,000–150,000	90,000–110,000	25–10	.....	20C–30C
Half-hard†	125,000–145,000	85,000–105,000	20–5	.....	15C–28C
Half-hard, age-hardened†	150,000–180,000	110,000–130,000	15–3	.....	28C–35C
Spring temper†	145,000–165,000	105,000–120,000	8–3	.....	25C–32C
Spring temper, age-hardened†	170,000–200,000	125,000–145,000	10–2	.....	33C–40C
Wire, Cold-drawn					
Annealed, quenched	90,000–110,000	40,000–65,000	45–25	.....	.....
Annealed, age-hardened	130,000–150,000	90,000–110,000	30–15	.....	.....
Spring temper, as drawn‡	145,000–185,000	.....	.....	.....	.....
Spring temper, age-hardened‡	170,000–200,000	.....	.....	.....	.....
Pipe and Tubing, Cold-drawn, Seamless					
Annealed	90,000–110,000	40,000–65,000	40–25	.....	90B max.
Annealed, age-hardened	130,000–150,000	90,000–110,000	25–10	.....	20C–30C
As drawn	110,000–160,000	85,000–140,000	15–2	.....	15C–32C
As drawn, age-hardened	140,000–215,000	100,000–200,000	20–3	.....	27C–40C

*For information only; not for specification purposes. †These tempers produced in strip only. ‡Properties shown are for wire sizes up to and including 5/16 inch diameter.

MACHINERY'S Data Sheet No. 668, October, 1950

Compiled by the International Nickel Co., Inc., New York

NEW POWER UNITS FOR EX-CELL-O SPECIAL MACHINES



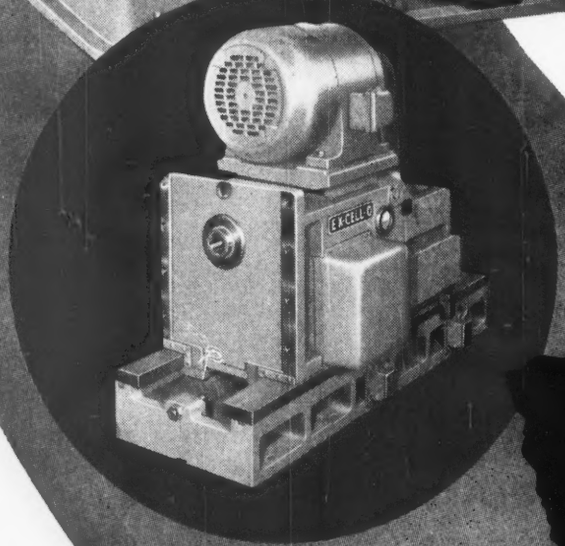
CONFORM TO J. I. C. STANDARDS

This Ex-Cell-O Special Machine utilizes a new slide type hydraulic power unit for rotating and feeding the tools in the multiple spindle head. The new power units, in two sizes to accommodate motors up to 25 horsepower, are built in strict conformance with the standards established by the Joint Industry Conference of the automobile industry.

Ex-Cell-O Slide Type Hydraulic Power Units do not replace the standard Ex-Cell-O Quill Type Hydraulic Power Units which are used to drive less bulky multiple spindle heads or single tools. Both types of units often are used to good advantage on the same machine.

For economy in multiple machining operations such as drilling, reaming, spotfacing and counterboring, be sure to get a quotation on an Ex-Cell-O machine with standard, versatile Ex-Cell-O Hydraulic Power Units.

XLO
EX-CELL-O for PRECISION



Ex-Cello-O Style [illegible] Slide Type Hydraulic Power Unit with motor mounted for horizontal installation. Same unit is mounted vertically on machine above.

FEATURES

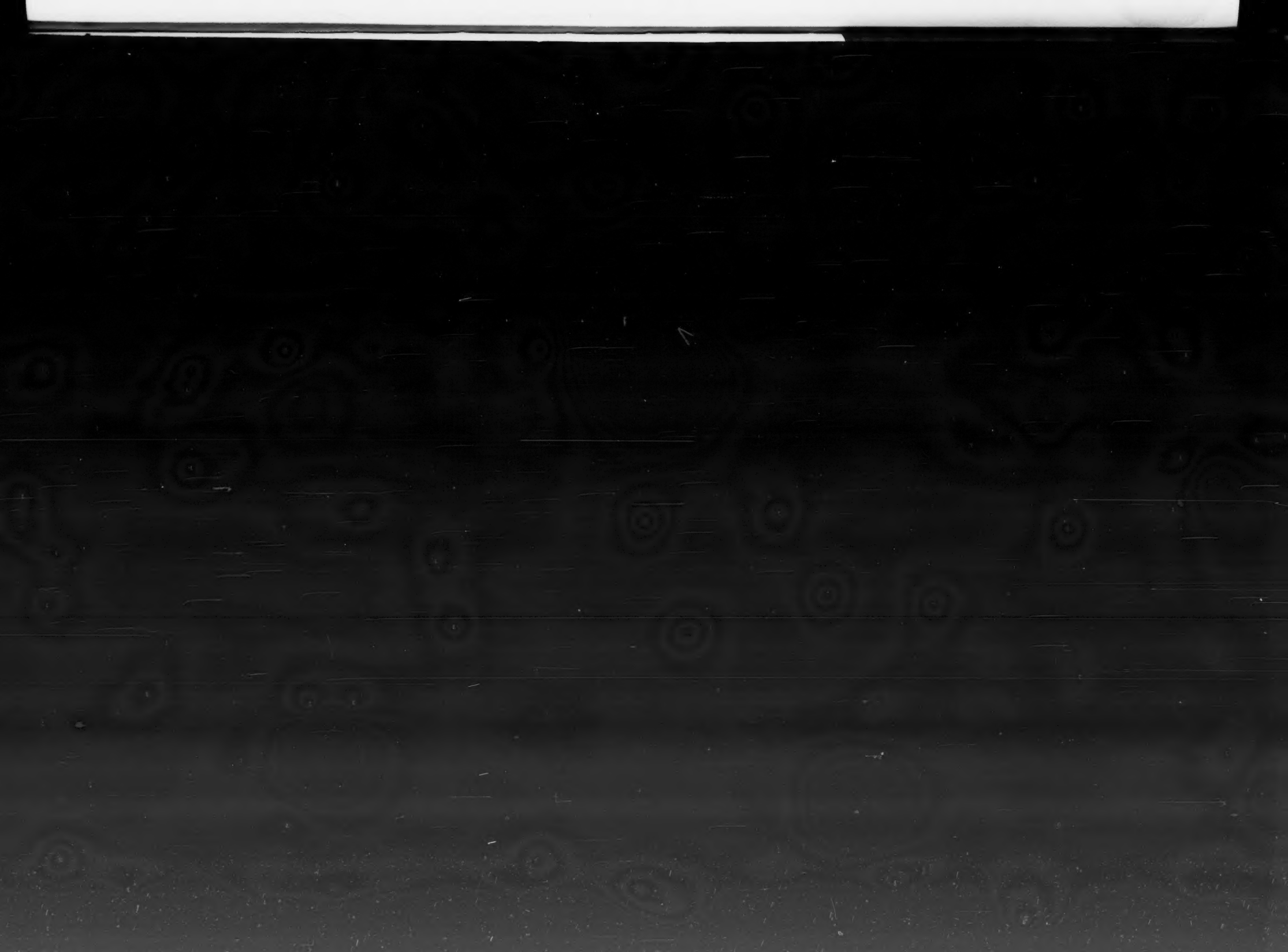
of Ex-Cell-O Slide Type Hydraulic Power Units

1. Conform to J.I.C. standards
2. Smooth hydraulic action
3. Simple construction—no gears
4. Adjustable automatic cycles
5. Self contained—can be re-used
6. Hardened, ground steel ways
7. Manifold-mounted hydraulic components
8. Positive stop in line with thrust

50

EX-CELL-O CORPORATION DETROIT 32 MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



Michigan

RUTLAND TOOL SERVICE has recently moved into its new plant at 1617 E. McNichols Road, Detroit, Mich., which affords over 10,000 square feet of floor space. The plant is being used for the manufacture of special tools from standard tools and for the reconditioning of high-speed steel and carbide cutting tools. A portion of the building is occupied by the Union Twist Drill Co. as a tool warehouse for the midwestern area.

JOHN H. BURCH has been appointed sales manager for the Detroit district of the Wickwire Spencer Steel Division, Colorado Fuel & Iron Corporation, New York City. Mr. Burch will make his headquarters at the Detroit district sales office, 1915 National Bank Bldg., Detroit 26, Mich. He succeeds L. A. WATTS, who has assumed other duties, with headquarters at Buffalo, N. Y.

CHESTER M. ADAMS has been appointed vice-president in charge of production and research for Crobalt, Inc., Ann Arbor, Mich., manufacturer of non-ferrous cast-alloy cutting tools and wear-resistant alloys. Mr. Adams was previously sales and application engineer with Kennametal, Inc., Latrobe, Pa.

WARD LEONARD ELECTRIC CO., Mount Vernon, N. Y., announces the appointment of JESSE W. EAKINS CO., 3105 E. Grand Blvd., Detroit 2, Mich., as sales representative of the company.

New England

J. EARLE MAKANT has retired as vice-president and factory manager of the Potter & Johnston Co., Pawtucket, R. I., to take a well earned rest after serving the company for a period of thirty-four years. Mr. Makant entered the employ of Potter & Johnston in April, 1916, as a draftsman, and advanced successively to various important positions, including chief tool designer, chief engineer, assistant sales manager, and factory manager. Upon resigning, he was given a dinner and presented with a clock by his associates. WILFRED J. PENDER has been named factory manager to succeed Mr. Makant. He has been connected with the company since 1923 (with the exception of one year), and previously held the position of assistant factory manager. Another appointment just announced is that of EDWARD P. GILLANE as vice-president and general manager. Mr. Gillane joined the company in March, 1948, when the plant was taken over by Pratt & Whitney Division of Niles-Bement-Pond Co., filling the position of vice-president and controller.

REM-CRU TITANIUM, INC., has been established by REMINGTON ARMS CO., INC., and CRUCIBLE STEEL CO. OF AMERICA to manufacture titanium and titanium-alloy products. W. H. COLVIN, JR., president of the Crucible Steel Co. of America, will be president and a director of the company. The chairman of the board is C. K. DAVIS, president and general manager of the Remington Arms Co. For the present, manufacturing and sales headquarters will be in Bridgeport, Conn., but it is planned later to establish headquarters at Pittsburgh.

PARSONS TOOL, INC., 56 Washington Ave., Berlin, Conn., is offering industry a new carbide tool service by means of which dies hardened to 62 Rockwell C that require repairing can be machined without annealing by the use of carbide tools especially designed by the company. The company is prepared to handle rush jobs requiring the repair or altering of dies, and will supply information on how to establish a carbide tool department to firms that may be interested in doing this work themselves.

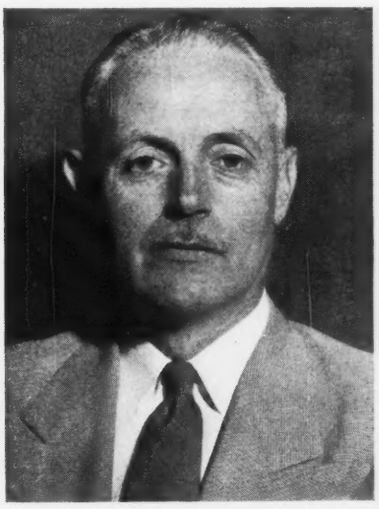
BURVEE M. FRANZ, superintendent of the Cartridge Division of the Winchester Repeating Arms Co. Division, Olin Industries, New Haven, Conn., has been appointed assistant works manager. LEONARD K. BROWN, assistant to Mr. Franz, will succeed him as superintendent of the Cartridge Division.

LAPOINTE MACHINE TOOL CO., Hudson, Mass., announces that its British affiliate, the LAPOINTE MACHINE TOOL CO., LTD., has opened a new and greatly enlarged plant at Bushey, Hertfordshire, England, for the manufacture of broaching machines and broaches. The plant was formerly located at the nearby town of Edgware. The new building has 40,000 square feet of production area.

QUIMBY PUMP DIVISION OF THE H. A. PORTER CO., INC., Pittsburgh, Pa., has been sold to the WARREN STEAM PUMP CO., INC., Warren, Mass.

New Jersey

ALTON H. LUNDIUS has been appointed works manager in charge of all manufacturing and service operations at the Harrison, N. J., and Clark Township plants of Hyatt Bearings Division, General Motors Corporation; ROBERT R. GUEMPEL has been made plant manager of the Clark Township plant; WILLIAM H. CHAPMAN becomes director of engineering, coordinating machine and product design, research, and application



(Left to Right) J. Earle Makant, who has recently resigned as vice-president and factory manager of the Potter & Johnston Co. after thirty-four years of service with the company; Wilfred J. Pender, who succeeds Mr. Makant as factory manager; and Edward P. Gillane, new vice-president and general manager

engineering; and MARTIN A. MOORE has been named administrative assistant to the general manager.

BENNETT MACHINERY CO., a machine tool business that has maintained headquarters at 30 Church St., New York City, for the last twenty-seven years, has started construction on a new office building adjoining its plant in Clifton, N. J., which is expected to be ready for occupancy some time this fall.

LAWRENCE H. RUSSELL has been made sales manager of the Walker-Turner Division, Kearney & Trecker Corporation, with headquarters at Plainfield, N. J. He formerly held the post of sales manager of the Power King Division, Atlas Press Co.

JAMES J. HAGAN has been made assistant plant manager of the Weston Electrical Instrument Corporation, Newark, N. J. He was previously personnel director.

New York

JOHN A. DECKER has been made sales manager for the New York district of the Carborundum Co., Niagara Falls, N. Y., and WILLIAM J. KINGSLEY has been named assistant sales manager of the Bonded Products and Grain Division, with headquarters in Niagara Falls. Mr. Decker was previously assistant sales manager of the New York district, and Mr. Kingsley was a salesman in the Syracuse, N. Y., and Boston, Mass., territories. Other changes announced by the company include the transfer of THOMAS CURTISS, field sales representative in the Buffalo district, to the central New York area, the vacancy at the Buffalo district office being filled by EDGAR T. HARRIS; and the appointment of GEORGE DENNISON as special sales engineering representative for New York State, with headquarters in the Buffalo district office. Mr. Dennison was formerly an industrial salesman in the Buffalo district.

C. R. MAXON, of the Market Development Division of the New Jersey Zinc Co., New York City, was presented with the first Doehler Award of the American Die-Casting Institute at the annual meeting of the Institute in Chicago. This award will be made each year for outstanding achievements contributing to the advancement of the die-casting industry. It consists of a plaque, a certificate stating the achievements of the winner, and a cash award of $500. Mr. Maxon was presented with the award for his accomplishments in demonstrating to government engineers at Washington, D. C., and in the Canal Zone the suitability of die-castings of the proper standards for gruelling service and severely destructive atmospheres, such as exist at Panama.

GENERAL ELECTRIC CO., Schenectady, N. Y., has announced the following appointments in the Small and Medium Motor Divisions: CHARLES STOECKLY, manager of the sales division; CARL J. ANDERSEN, manager of the manufacturing division; and L. A. MARCH, manager of the engineering division. Announcement has also been made of the following appointments in the Large Motor and Generator Engineering Division: BASCOM H. CALDWELL, JR., assistant manager of engineering; and D. E. BRAINARD, HOWARD D. SNIVELY, ROBERT V. SHEPHERD, and ROBERT W. WIESEMAN, division engineers.

(Left) John A. Decker, recently appointed New York District sales manager for the Carborundum Co. (Right) William J. Kingsley, assistant sales manager of the Bonded Products and Grain Division

HERBERT ASHCROFT, JR., has joined the Bausch & Lomb Optical Co., Rochester, N. Y., in the capacity of staff industrial engineer. He was previously in charge of manufacturing operations at the New Jersey Optical Co., Irvington, N. J. In his new assignment, he will assist the works manager and division superintendents with general manufacturing problems.

HAUSER MACHINE TOOL CORPORATION, 30 Park Ave., Manhasset, N. Y., has been made exclusive U. S. factory representative for AGATHON LTD., Soleure, Switzerland, manufacturer of tool grinding and lapping machines and high-precision die sets.

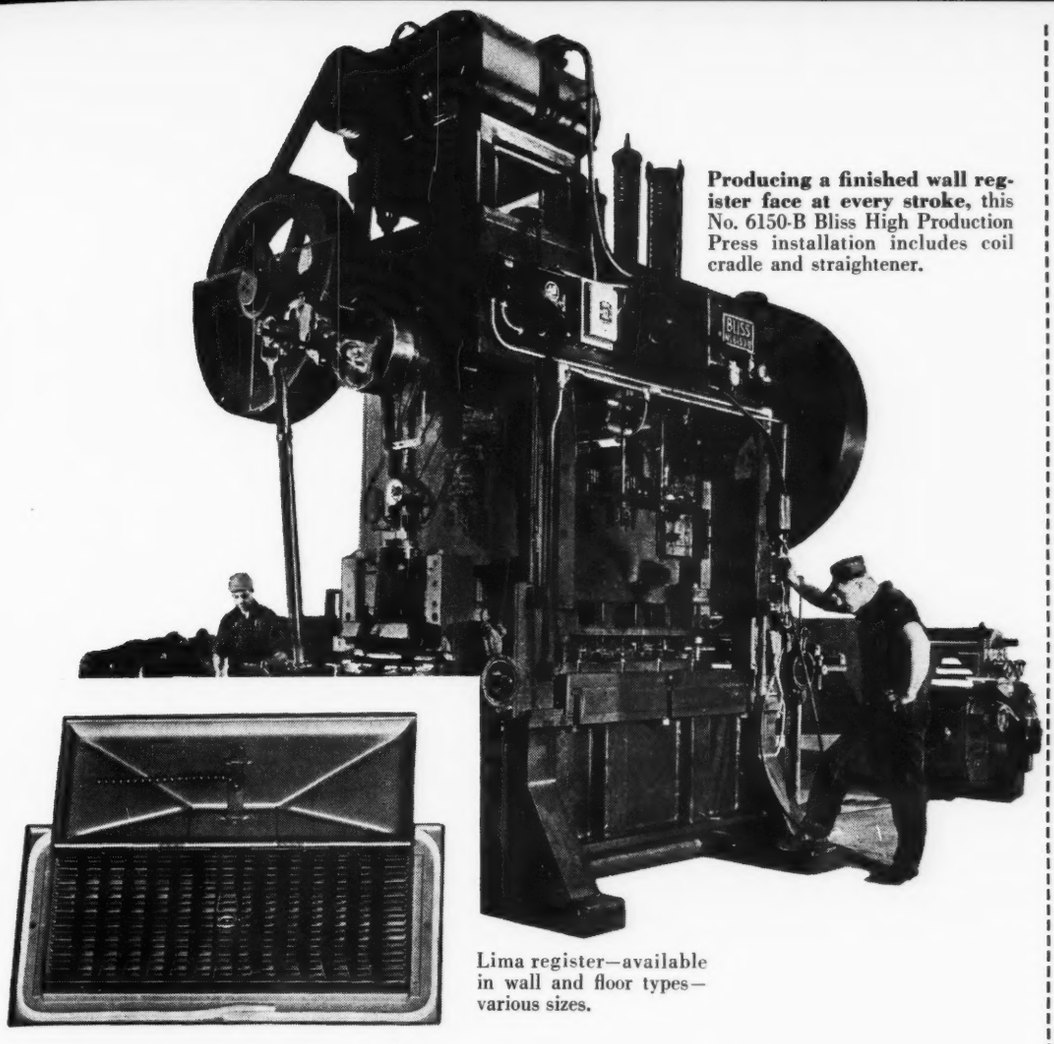
V & O PRESS DIVISION OF ROCKWELL MFG. CO., Hudson, N. Y., has been purchased by the HARTFORD-EMPIRE CO. The plant will continue under the management of HERMAN F. ZORN, and no personnel changes are contemplated.

Ohio

HARRY L. JENTER, general superintendent of the Cuyahoga Works of the American Steel & Wire Co., Cleveland, Ohio, has been named chief engineer of the company, succeeding ROBERT E. CRAMER, who has been appointed to the newly created post of chief engineer for the Cyclone Fence Division. NELSON W. DEMPSEY, formerly general superintendent of the Waukegan, Ill., plant, will take Mr. Jenter's place at the Cuyahoga Works and, in turn, will be succeeded by JAMES E. BROWN as general superintendent at Waukegan.

JOHN L. FULLER has been appointed to the post of technical coordinator by the Reliance Electric & Engineering Co., Cleveland, Ohio. CHARLES R. SUTHERLAND, who formerly directed engineering for the smaller size Reliance motors, has been promoted to the new position of manager of engineering for the company's Ivanhoe Division products. A third appointment recently announced is that of EARL C. BARNES as manager of engineering for the Ashtabula Division products.

RELIANCE ELECTRIC & ENGINEERING CO., Cleveland, Ohio, announces that it has purchased a controlling interest in the COMMONWEALTH ELECTRIC CO., LTD., Welland, Ontario, Canada, manufacturer of transformers and electric motors, both of which products will continue to be made at the Welland plant. The presidency of the Commonwealth Electric Co., which has been open since the death of Russell Stinson, will be filled by J. W. COREY, president of the Reliance Electric & Engineering Co.



Producing a finished wall register face at every stroke, this No. 6150-B Bliss High Production Press installation includes coil cradle and straightener.

Lima register—available in wall and floor types—various sizes.

5 Bliss Automatic Presses at Lima Register Co. equal output of 65 hand-fed

COST OF VALVE IS 1/25th THAT OF HAND-FED PART

It's a fact! In choosing equipment and methods to produce stampings for the famous Lima Register, Bliss and Lima engineers agreed that 5 Bliss presses set up for automatic operation would equal the output of 65 hand-fed presses.

Now, 18 months later, the plant is in full production and the 5 Bliss presses are turning out all the stampings required.

Two Bliss High Production Presses with progressive dies and Bliss coil cradles handle the bulk of the production. Stamping runs of 15,000 or more are assigned to these presses. Bliss Inclinable Presses with roll feeds are exactly suited for the production of a variety of small-lot stampings.

An example of the unusual savings achieved by Lima is the floor register valve. Formed complete—80 a minute—in a Bliss No. 675 High Production Press, it costs only 1/25th of a hand-fed stamping.

Similarly, high savings are obtained on all stampings produced on Bliss automatic presses.

If your stamping runs are 50,000 or more ask Bliss engineers how High Production Presses can increase your profits. Your nearest Bliss representative will be glad to talk about converting your hand-fed stampings to automatic operation.

E. W. BLISS COMPANY, CANTON, OHIO

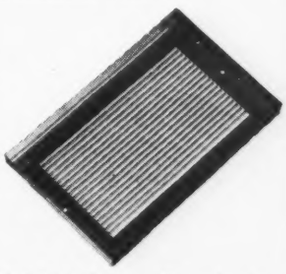
Valve for floor register...80 per minute...20 gauge steel...675 Bliss High Production Press.

Body slide...80 per minute...20 gauge steel...675 Bliss High Production Press.

Short border...75 per minute... 16 gauge steel...6150 Bliss High Production Press.

Sliding channel...100 a minute ...20 gauge steel...675 Bliss High Production Press.

Hinge angle...100 a minute...20 gauge steel...675 Bliss High Production Press.



Cold air face...40 a minute... blanked on 6150 Bliss High Production Press; formed on 21½ Bliss Inclinable Press.

Chain clip...100 a minute...24 gauge steel...Bliss 21-B Inclinable Press.

MARQUETTE · BLISS · CONSOLIDATED · TOLEDO ·

BLISS BUILT

FROM THE RIGHT PRESS FOR A GIVEN JOB

...TO A COMPLETE PRESS ROOM...

It's Bliss

E. V. Crane, who has returned to the engineering staff of the E. W. Bliss Co.

E. V. CRANE has returned to the engineering staff of the E. W. Bliss Co., Toledo, Ohio, and will make his headquarters at the company's new Canton plant, where rolling mills and large presses are built. Mr. Crane had formerly been associated with the company for twenty-five years. During the war, he resigned to take a position with Sam Tour & Co., research and engineering organization, as vice-president in charge of mechanical engineering. Later he became chief engineer of the Hydraulic Press Mfg. Co. During his former association with the company, Mr. Crane did extensive research work, and was responsible for certain of the sales engineering and development engineering activities of the company for a number of years. He will devote his time to a Government assignment, working on an analysis of press requirements for emergency planning purposes.

DENISON ENGINEERING CO., Columbus, Ohio, announces the appointment of the following sales representatives to handle the Multipress line: V. P. PREIDIS, P.O. Box 608, Manchester, Conn.; FRANK KRAUSE, 306 New St., Garwood, N. J., replacing PEARCE EDWARDS in northern New Jersey and several counties in New York State; and VAN DYCK CHURCHILL CO., 114 Liberty St., New York 6, N. Y.

SENECA FALLS MACHINE CO., Seneca Falls, N. Y., has appointed MCNETT & HODSON, 18609 St. Clair, Cleveland, Ohio, representative in northeastern Ohio for the Seneca Falls line of "Lo-swing" lathes, automatic drilling and centering machines, automatic work-drivers, and loading devices.

WILLIAM G. MCCLAIN has been appointed sales engineer for the Rolling Mill Division of the E. W. Bliss Co., with headquarters in Salem, Ohio. Prior to his present connection, Mr. McClain was associated with Furnace Engineers, Inc., of Pittsburgh, Pa., in the capacity of sales engineer.

EDWARD F. TEYBER has been appointed manager of the newly created Industrial Division of Lowe Brothers Co., Dayton, Ohio, manufacturer of paints and varnishes. He has been connected with the company for thirty years, and prior to his present appointment served as manager of the Central Industrial District. J. B. WOODS, formerly an industrial salesman for the company in the Chicago area, has been made sales manager of the Industrial Division. Other changes include the appointment of

Edward F. Teyber, manager of new Industrial Division of Lowe Brothers Co.

ROBERT DRERUP, formerly of the industrial trade sales department, as Assistant Manager of the new division, and FRANK MUSCH as industrial representative in the Chicago area. Concurrent with these changes is the announcement of the retirement of C. L. VANDEMAN as manager of industrial trade sales after having been associated with the company for thirty-three years.

FLOYD A. GARMAN has been made assistant chief engineer of the American Steel & Wire Co., Cleveland, Ohio. He was previously projects division engineer, and will be succeeded in that position by CHARLES B. HULL, of the general engineering department.

ELMER W. KRUEGER, operations manager of the Cleveland Pneumatic Tool Co., Cleveland, Ohio, was recently elected a member of the board of directors.

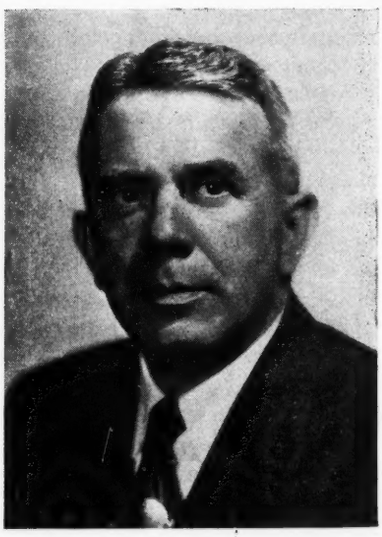
Pennsylvania

ROGER S. AHLBRANDT has been appointed to the newly created position of manager of stainless-steel bar sales for the Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. Previous to his present appointment, he was assistant manager of cutting tool sales. I. R. LEHENY, formerly sales manager at the San Francisco, Calif., district office, will succeed Mr. Ahlbrandt as assistant manager of cutting tool sales, and Mr. Leheny's previous position will be taken by GUY M. WINTON, of the San Francisco office.

WALTHER L. HAVEKOTTE has been appointed assistant manager of research of the Firth Sterling Steel & Carbide Corporation, McKeesport, Pa. For ten years prior to joining the company, he was research engineer for the Battelle Memorial Institute, Columbus, Ohio.

E. C. HANKS has been appointed sales manager of the Gearing Division of the Westinghouse Electric Corporation, Pittsburgh, Pa. He was previously Gearing Division representative for the northwestern district, with headquarters at Chicago.

R. B. CREAN has recently been elected vice-president in charge of apparatus sales at the Baldwin Locomotive Works, Eddystone, Pa. Following his appointment, he announced the following changes in the sales organization: E. R. WISNER has been appointed manager of the locomotive department; E. F. SHEEHAN has been made manager of the renewal parts



R. B. Crean, recently elected vice-president in charge of apparatus sales, Baldwin Locomotive Works

The NEW MOTCH & MERRYWEATHER No. 00-G Circular Sawing Machine

No. 00-G automatic model has air-operated stock feed for standard lengths up to 24".

Insert jaws of desired angle permit precision cut-off of stock up to 45° angle.

NOW, for the first time on a circular sawing machine, you can do square and angular cutting up to 45° of ferrous or non-ferrous stock up to 3" round or square, *fast and accurately.* The rugged one-piece saw head is gravity fed; speed changes by pick-off gears. Automatic stock feed for high production; manual feed for smaller shops and tool rooms. Special fixtures for odd-shaped parts. *Let us figure how much we can save you* on that next difficult job.

Write today for Bulletin 00-G.

Manufactured by

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
715 PENTON BUILDING • CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

department; ANDREW LISTON has been appointed manager of the hydraulic turbine and marine products department; and M. L. HALL has been named manager of the testing equipment department.

John R. Harbaugh, assistant general manager of sales for the Jessop Steel Co.

JOHN R. HARBAUGH has been appointed assistant general manager of sales for the Jessop Steel Co., Washington, Pa. He has been associated with the company for the last ten years, doing special assignment work in metallurgical sales. EUGENE N. LOHRE has been named district manager of the Chicago territory, with offices at 322 S. Michigan Ave., Chicago, Ill., and HOMER A. MAWHINNEY has been appointed district manager of the southern territory, with headquarters at 1760-F Valley Ave., Birmingham, Ala.

P. L. EDWARDS has been made manager of the central district office in Pittsburgh of Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J. He succeeds R. C. RICE, who has retired from active service with the company.

RESISTANCE WELDER MANUFACTURERS ASSOCIATION has changed the address of the headquarters from 505 Arch St., where the association has been located for the last forty-one years, to 1900 Arch St., Philadelphia 3, Pa.

LOUIS M. TEICH has been made branch manager of the Philadelphia office and warehouse of the Latrobe Electric Steel Co., Latrobe, Pa.

Texas and Louisiana

E. D. CASSEDAY has been appointed Houston, Tex., district sales manager for the Bridgeport Brass Co., Bridgeport, Conn. Mr. Casseday, recently with the Los Angeles office of the company, succeeds GEORGE CHATNEUFF in his new position.

RAYBESTOS-MANHATTAN, INC., Passaic, N. J., announces the removal of its New Orleans office and warehouse from 1009 Camp St., to 920 Calliope St.

Wisconsin and Minnesota

FRANK T. WRUK has been elected vice-president in charge of sales and service of the Peerless Machine Co., Racine, Wis. He has been connected with the company since 1920, working progressively in the various departments. Previous to entering the sales engineering and service end of the business, he held the position of assistant works manager.

DAYTON ROGERS MFG. CO., Minneapolis, Minn., is offering a new service to industry, which consists of the production of precision die-molded plastics in small lots, such as are required for experimental development purposes. A new process developed for this purpose makes possible rapid delivery of the molded parts.

Obituary

GEORGE R. GIBBONS, one of the pioneers in the development of the aluminum industry and a director of the Aluminum Co. of America, died on September 3 at the West Penn Hospital in Pittsburgh, aged seventy-one years. Mr. Gibbons, who retired as senior vice-president of the company on January 1, 1949, began his career with Alcoa in 1901 as a chemist at the New Kensington plant. In 1906, he became director of sales promotion for the company, and four years later was elected secretary. The following year he was made a vice-president. He was appointed director of sales in 1928, and was promoted to the position of senior vice-president in 1931, at the same time continuing to hold the post of secretary until 1944.

* * *

Annual Index to MACHINERY

The annual index to Volume 56 of MACHINERY (September, 1949, to August, 1950, inclusive) is now ready for distribution. Subscribers who have not previously requested copies can obtain them without charge by writing to MACHINERY, Circulation Department, 148 Lafayette St., New York 13, N. Y.

Coming Events

OCTOBER 16-20 — Thirty-eighth NATIONAL SAFETY CONGRESS and EXPOSITION in Chicago, Ill. R. L. Forney, general secretary, National Safety Council, 425 N. Michigan Ave., Chicago, Ill.

OCTOBER 18-19—Sixth annual NATIONAL CONFERENCE ON HYDRAULICS at the Sherman Hotel in Chicago. Conference director, Otto J. Maha, vice-president, Hannifin Corporation, 1109 S. Kilbourn Ave., Chicago 24, Ill.

OCTOBER 18 - 20 — Annual national conference of the SOCIETY OF THE PLASTICS INDUSTRY at New Ocean House, Swampscott, Mass. William T. Cruse, executive vice-president, 295 Madison Ave., New York 17.

OCTOBER 23-25—Fall meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION at the Edgewater Beach Hotel, Chicago, Ill. Executive secretary, Newbold C. Goin, Empire Bldg., Pittsburgh 22, Pa.

OCTOBER 23-27—Fall meeting of the Metals Branch of the AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS in Chicago, Ill. National secretary, E. H. Robie, 29 W. 39th St., New York 18, N. Y.

OCTOBER 23-27—Annual meeting of the AMERICAN SOCIETY FOR METALS in Chicago, Ill. National secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

OCTOBER 23-27—Annual meeting of the AMERICAN WELDING SOCIETY in Chicago, Ill. National secretary, J. G. Magrath, 33 W. 39th St., New York 18, N. Y.

OCTOBER 23-27—Annual meeting of the SOCIETY FOR NON-DESTRUCTIVE TESTING in Chicago, Ill. Secretary, Philip D. Johnson, Skokie, Ill.

OCTOBER 23-27 — NATIONAL METAL CONGRESS and EXPOSITION at the International Amphitheatre, Chicago, Ill. For further information, address W. H. Eisenman, managing director, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

OCTOBER 24-25—Third biennial MATERIALS HANDLING CONFERENCE in Buffalo, N. Y. Sponsored by the Westinghouse Electric Corporation, Pittsburgh, Pa.

OCTOBER 29-NOVEMBER 1—Fifth annual convention of the NATIONAL TOOL & DIE MANUFACTURERS ASSOCIATION at the Hotel Statler in Cleveland. Executive secretary, George S. Eaton, Union Commerce Bldg., Cleveland, Ohio.

(Continued on page 252)

MACHINE TOOL BUILDER CUTS COSTS 26%

. . . increases rigidity with welded design

By James A. McCallum, Plant Superintendent
American Broach and Machine Company
Ann Arbor, Michigan

Heavier tool pressures, higher cutting speeds and closer work tolerances in modern machine tools require designs having greater inherent rigidity. In many cases, where the size and weight of a particular machine tool is limited, the increased strength must, of necessity, be gained through more efficient use of higher tensile metals. With welded construction, the engineer has at his command new freedoms of design, allowing him to place the right amount of metal in the right places and, at the same time, lower manufacturing costs by using less material, eliminating pattern expense and simplifying machining and assembly.

Typical benefits gained by converting machine tool designs to welded construction are illustrated in the fabrication of the main column for a vertical broach at the American Broach & Machine Company (Fig. 1). To eliminate the delays of preparing patterns and castings and speed delivery, upright members (Fig. 2-3) are now being fabricated by arc welding. Because of the uniform quality and thickness of the steel components, less metal needs to be machined from the fabricated assembly, cutting both shop time and tooling costs.

Savings in cost on the column member average 26% excluding an estimated cost of $2000 for patterns that have been eliminated as well as one week's time for snagging and filling castings. By cutting 6,000 pounds from the weight, reduced shipping costs are helping to lower the prices quoted to our customers.

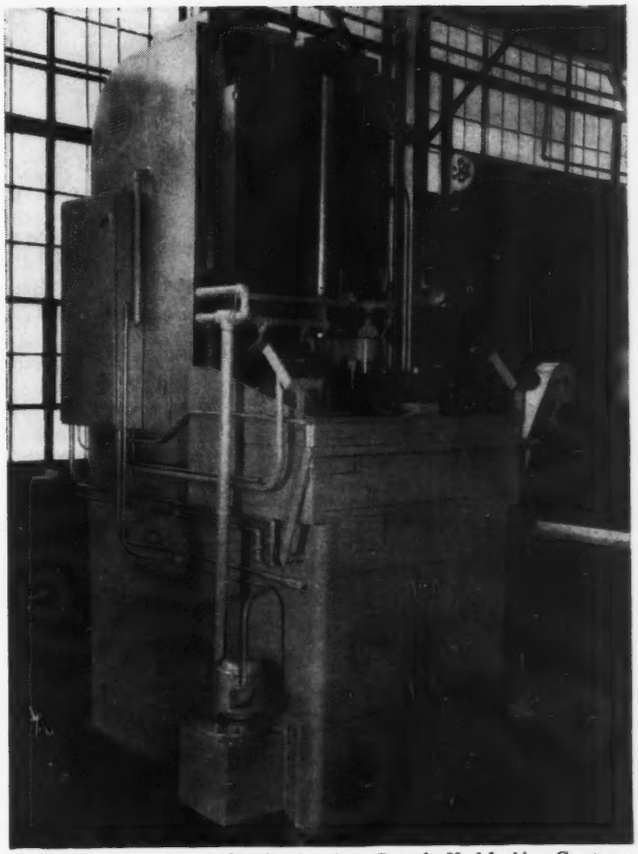


Fig. 1. *Surface broach for the American Broach & Machine Company, Ann Arbor, Michigan. Capacity 40 tons, height 15½ feet, weight 34 tons.*

Fig. 2. Greater rigidity with less weight. *Welded steel is 3 times stronger, 2½ times stiffer than cast iron, saves 6,000 pounds of metal on this main upright column member.*

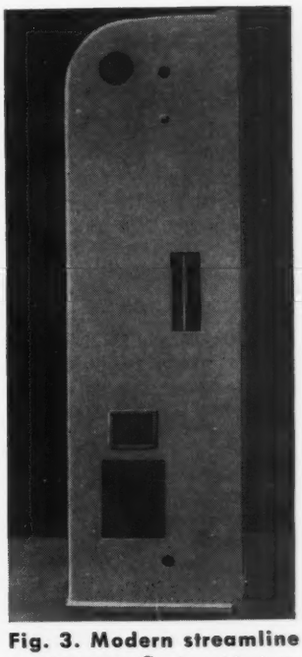


Fig. 3. Modern streamline appearance. *Component parts are cut and formed to shape before fast, simple downhand welded assembly.*

NOVEMBER 2-3—Fourteenth annual NATIONAL TIME, MOTION, AND MANAGEMENT CLINIC at the Sheraton Hotel, 505 N. Michigan Ave., Chicago, Ill. Sponsored by the Research Division of the Industrial Management Society, 35 E. Wacker Drive, Chicago 1, Ill.

NOVEMBER 2-3—Annual conference on principles, methods, and techniques for increasing productivity, reducing costs, and improving human relations, sponsored by the SOCIETY FOR ADVANCEMENT OF MANAGEMENT at the Hotel Statler, New York City. For further information, address the Society, 84 William St., New York 7, N. Y.

NOVEMBER 8-11—Annual convention of the manufacturers of Meehanite castings at the Hotel Knickerbocker, Chicago, Ill., under the auspices of the Meehanite Metal Corporation, New Rochelle, N. Y.

NOVEMBER 27-DECEMBER 2 — NINETEENTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING at the Grand Central Palace, New York 17, N. Y., in conjunction with the annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Secretary of A.S.M.E., Clarence E. Davies, 29 W. 39th St., New York 18.

JANUARY 15-18, 1951—SECOND PLANT MAINTENANCE SHOW AND CONFERENCE at the Auditorium, Cleveland, Ohio. For further information, address Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

MARCH 19-23, 1951—WESTERN METAL CONGRESS AND EXPOSITION at the Civic Auditorium, Oakland, Calif. Sponsored by the American Society for Metals. National secretary, William H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

APRIL 23-26, 1951—Fifty-fifth annual convention of AMERICAN FOUNDRYMEN'S SOCIETY in Buffalo, N. Y. Secretary-treasurer, William W. Maloney, 616 S. Michigan Ave., Chicago 5, Ill.

APRIL 30-MAY 4, 1951—FOURTH NATIONAL MATERIALS-HANDLING EXPOSITION in the International Amphitheatre, Chicago, Ill. Sponsored by the Materials Handling Institute. Further information can be obtained from the exposition management, Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y.

MAY 23-24, 1951—Fifth annual convention of the AMERICAN SOCIETY FOR QUALITY CONTROL in Cleveland, Ohio; headquarters, Hotel Cleveland. For further information, address John F. Occasione, Publicity Chairman, American Society for Quality Control, Care of American Steel & Wire Co., 1406 Rockefeller Bldg., Cleveland 13, Ohio.

New Books and Publications

METALS AT HIGH TEMPERATURES. By Frances H. Clark. 372 pages, 6 by 9 inches. Published by the Reinhold Publishing Corporation, 330 W. 42nd St., New York 18, N. Y. Price, $7.

The most recent available data on the properties of metals at extremely high temperatures is presented in this book for the use of the design engineer. Up to the present, such data have not been available in a single source. The book covers, primarily, heat-resistant alloys and special alloy steels, but also includes such other metals as aluminum, lead, and magnesium alloys.

The text is introduced by a discussion on the plasticity of metals with special reference to high-temperature effects. The phenomenon of creep in metals and alloys is fully treated, and there is a section on test methods for metals at high temperature and current manufacturing methods for heat-resistant alloys.

The text is divided into eleven chapters under the following headings: Introduction and Theoretical Aspects; Test Methods and Equipment for Elevated Temperature; Plain—Carbon and Low-Alloy Steels; Chrome Irons, Moderately Alloyed Austenitic Steels; Highly Alloyed Austenitic Steels; Cobalt-Base Alloys; Nickel-Base Alloys; Non-Commercial Alloys; Manufacturing Processes; Lower Melting Alloys; and Scaling.

The book will be of particular interest to those who are concerned with the engineering and metallurgical aspects of high-temperature service, particularly as regards turbojet airplane engines, in which these alloys are playing a critical part. Numerous other high-temperature demands are being made upon alloys in military uses, such as rockets, projectors, gun barrels, etc.

GEAR-CUTTING PRACTICE. By Fred H. Colvin and Frank A. Stanley. 532 pages, 6 by 9 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Price, $4.75.

This is the third edition of a book covering general gear-cutting practice. All types of gears in common use are shown, and the various methods by which they are cut are described. Machines and methods for making gears of different kinds and for checking their accuracy are illustrated; in addition, the standards adopted by the American Standards Association and the American Gear Manufacturers Association are outlined. The book has been completely revised to bring it up to date, the present edition including recent data on carbide-tipped hobs; hobbing speeds and feeds; involute splines; shaving and lapping of gear teeth; and inspection records.

FUNDAMENTALS IN THE PRODUCTION AND DESIGN OF CASTINGS. By Clarence T. Marek. 383 pages, 5 1/2 by 8 1/2 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $4.

Emphasizing the importance of correlating casting design with the economical manufacture of castings, this book presents an analysis of the techniques, skills, and practices of casting production. After giving a general picture of the industry, the author discusses jobbing shop molding; the theory of clay bond; patterns and cores; and new methods of high-voltage X-ray and supersonic inspection. Information is included on the properties and uses of ferrous and non-ferrous metals and the melting of cast metals.

DESIGN AND MANUFACTURE OF CONED DISK SPRINGS. Published by the Society of Automotive Engineers, Special Publications Department, 29 W. 39th St., New York 18, N. Y. Price, $1.75 to members; $3.50 to non members.

Three ways to design coned disk or Belleville springs and two ways to make them are described in this book, which is the sixth in a series on spring design published by the Society. Springs of this type are used in gun recoil mechanisms; as spring washers to give constant body loading or gasket pressure; in tailstock centers to take up expansion of work at constant thrust; and in clutches to apply load to the friction plates. Allowable height variations and manufacturing tolerances are also tabulated.

BRITISH ENGINEERS' ASSOCIATION HANDBOOK (1950 edition). 655 pages, 5 1/2 by 8 3/4 inches. Published by the British Engineers' Association, 32 Victoria St., London S.W.1, England.

This classified handbook of British engineering concerns and their products is available without charge to buyers doing business with the British engineering industry and agents throughout the world upon application to the Association.

SAFETY CODE FOR INDUSTRIAL POWER TRUCKS (ASA B56.1-1950). 31 pages, 5 1/4 by 7 3/4 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, 85 cents per copy.